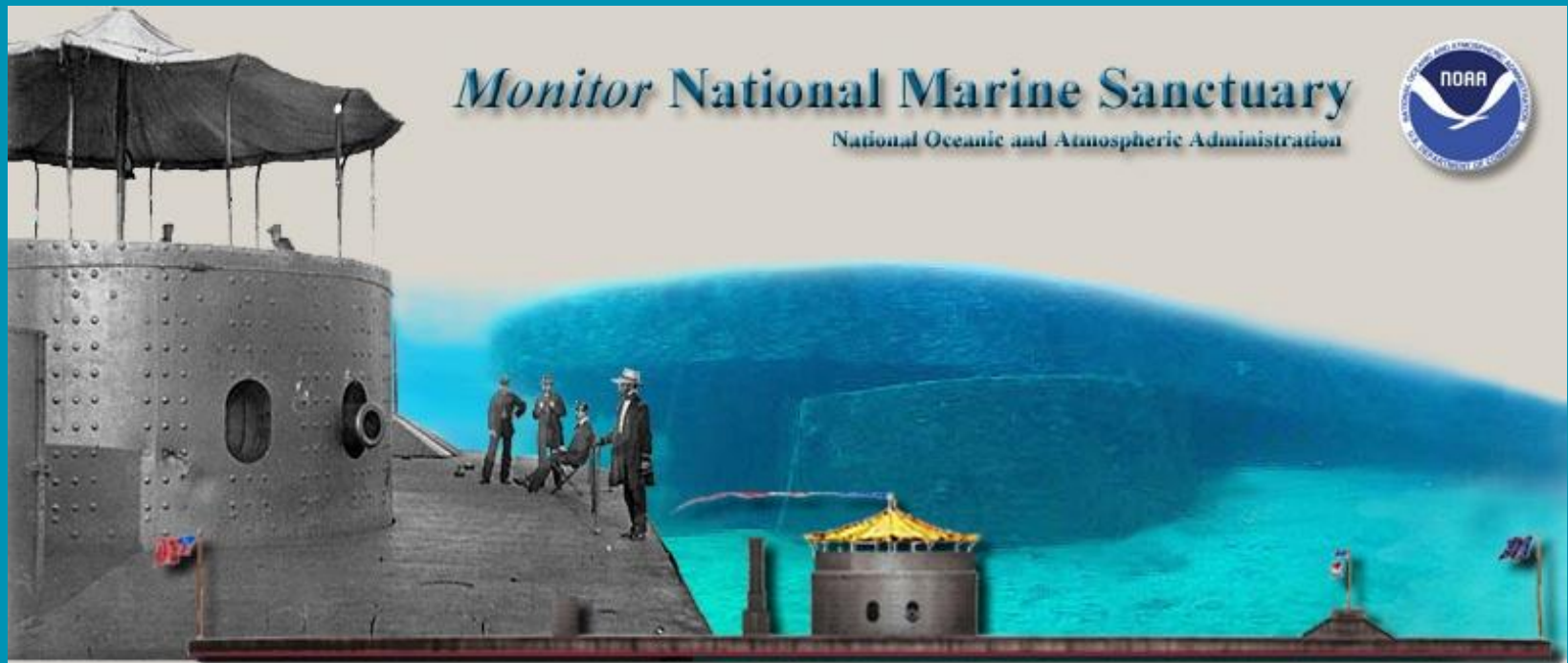


National Marine Sanctuaries
National Oceanic and Atmospheric Administration



NATIONAL MARINE
SANCTUARIES

Monitor National Marine Sanctuary



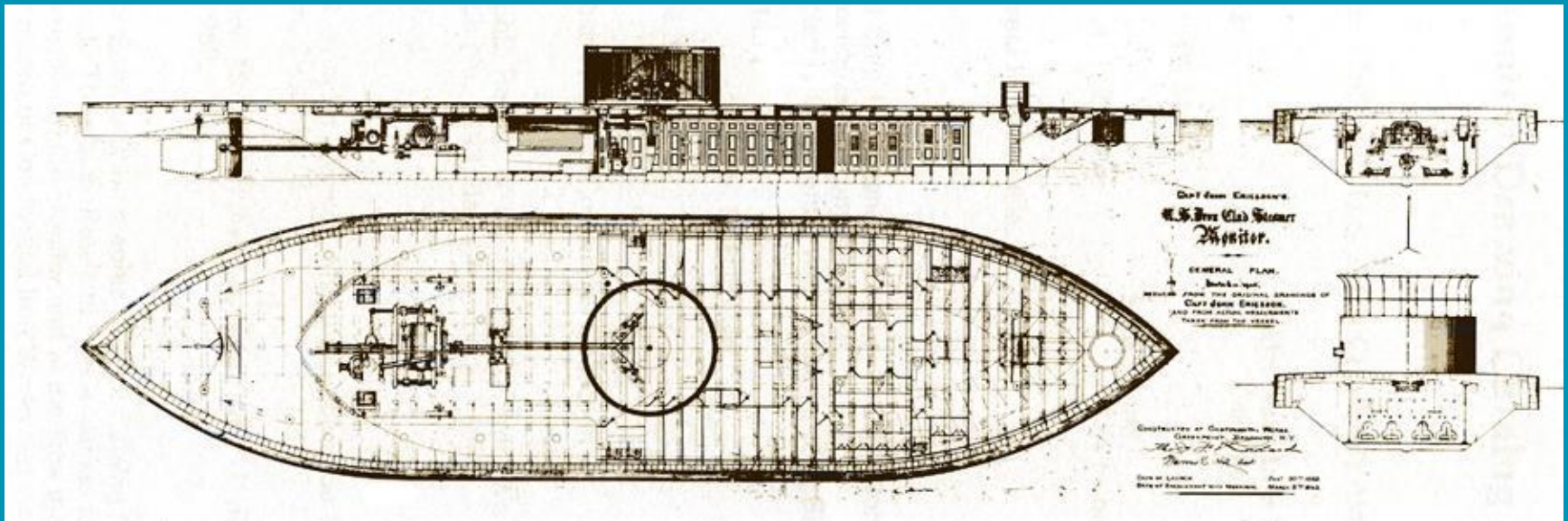
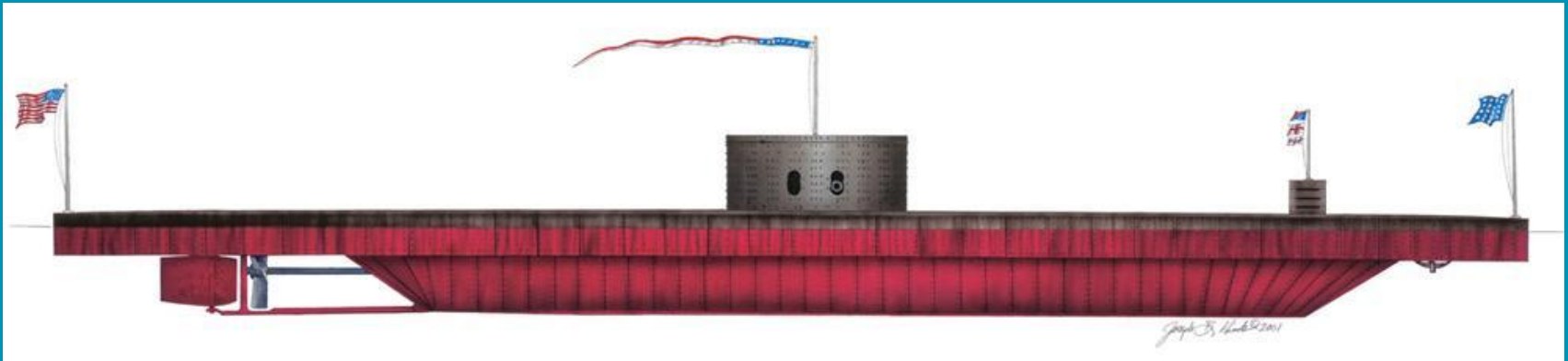
NATIONAL MARINE SANCTUARY SYSTEM



Curriculum and More

- Overview of the Monitor NMS and Maritime Heritage Program
- *Shipwreck of the Deep*—Integrated curriculum developed in partnership with Newport News Public Schools
- *Maritime Archaeology: Discovering and Exploring Shipwrecks*—A guide integrated with social studies and STEM
- Other Educational Offerings—A variety of standalone activities and learning modules from Civil War to WWI

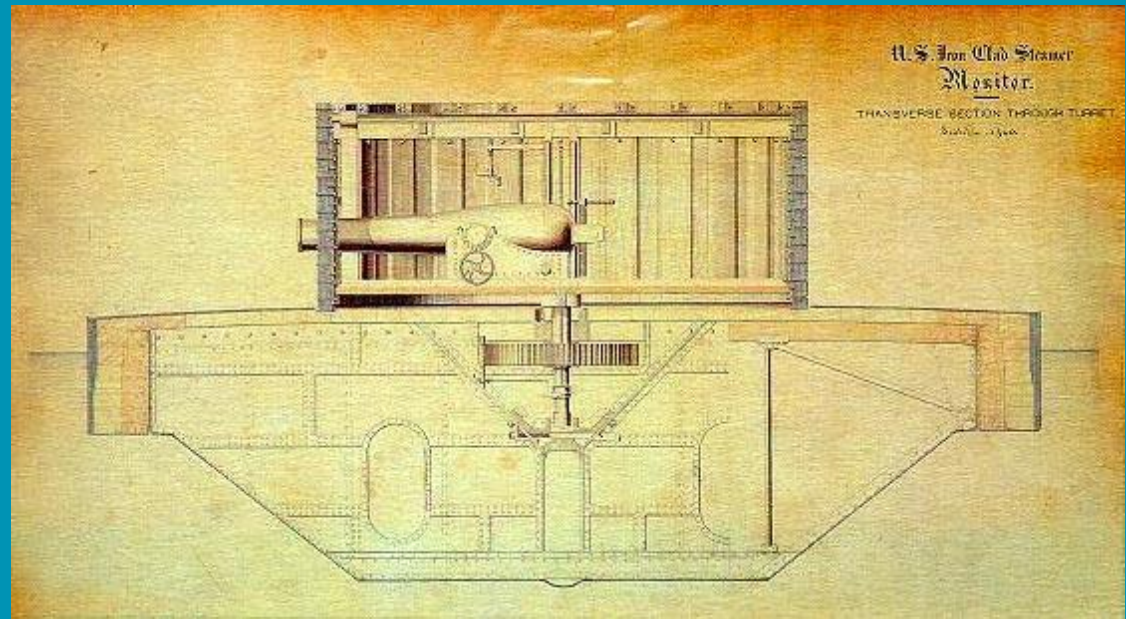
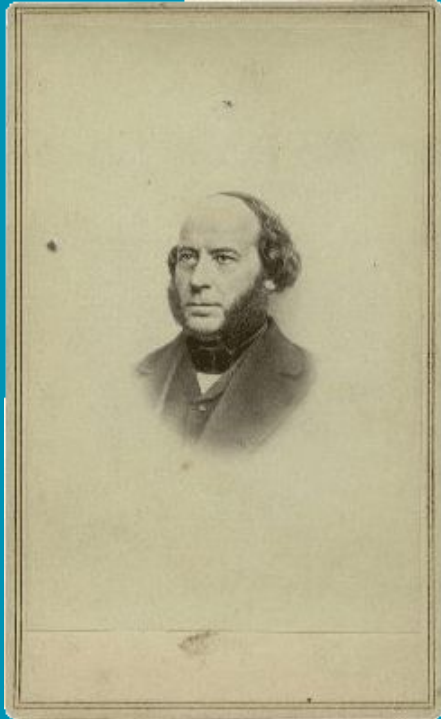
What was the USS *Monitor*?

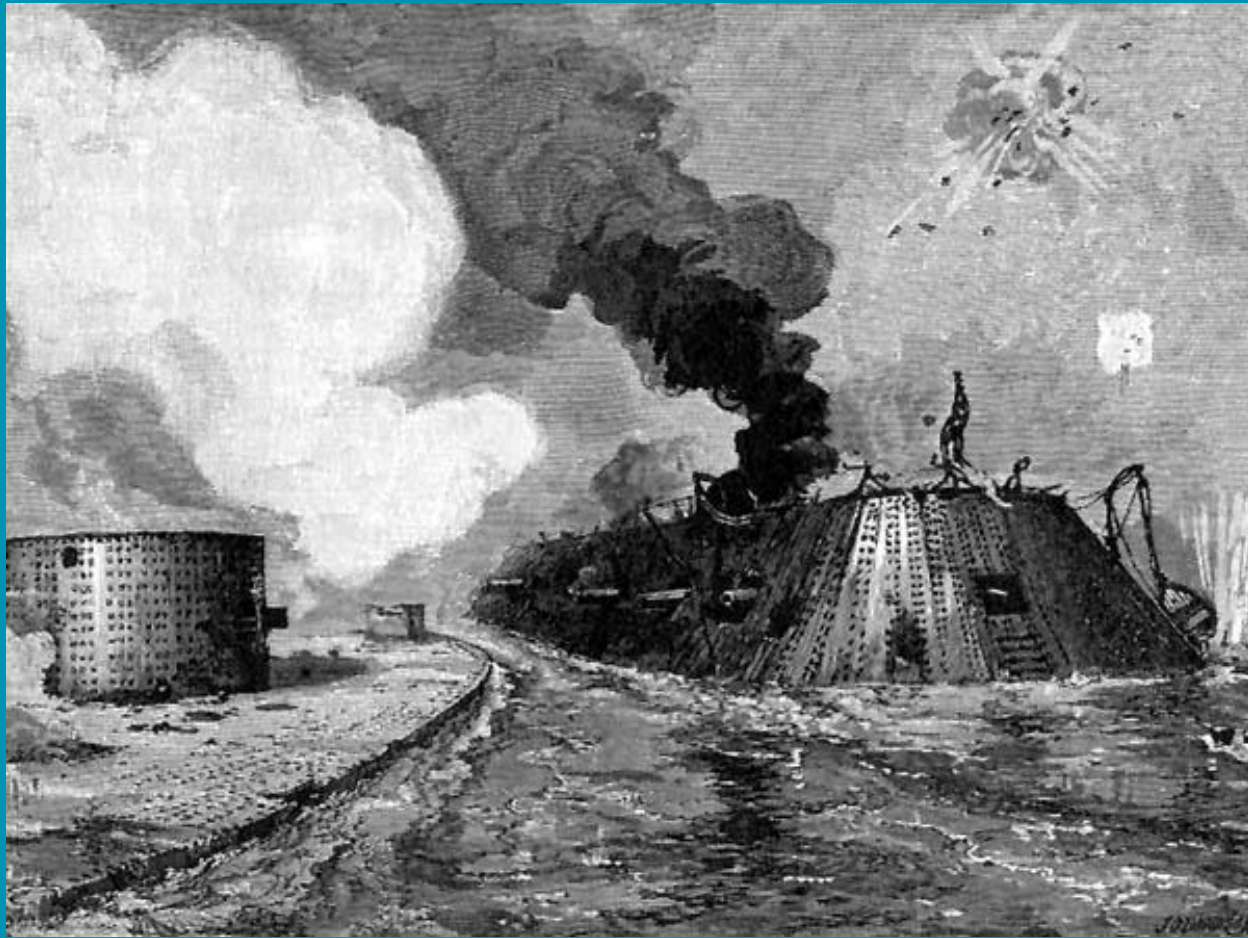


An Innovative Warship Built in less than 100 Days

Inventor and Innovator

- John Ericsson
- Innovative Technology
- Major Impact on Maritime and Military History

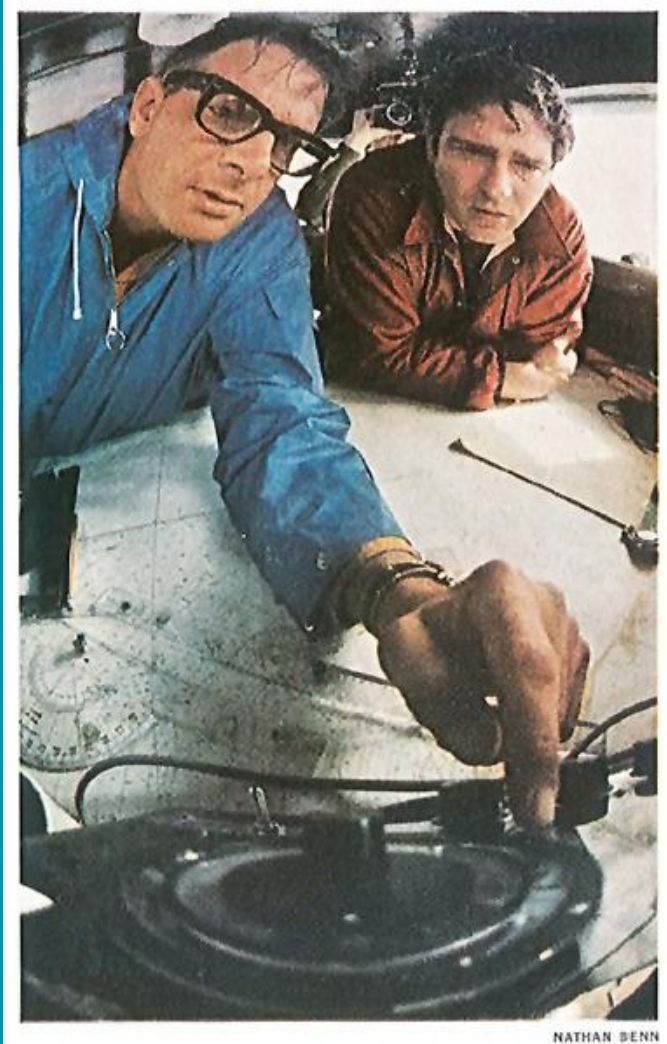




USS *Monitor* and the CSS *Virginia* engage in the first battle of steam powered ironclads. The battle ushers in a new era of naval technologies and naval warfare.



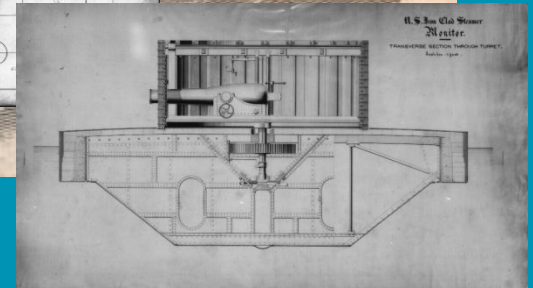
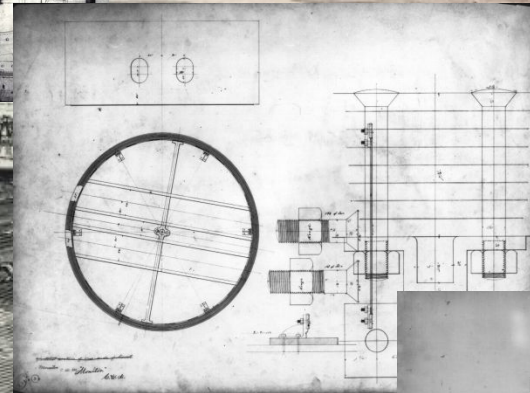
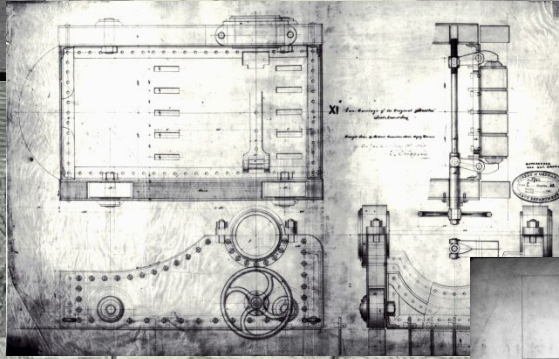
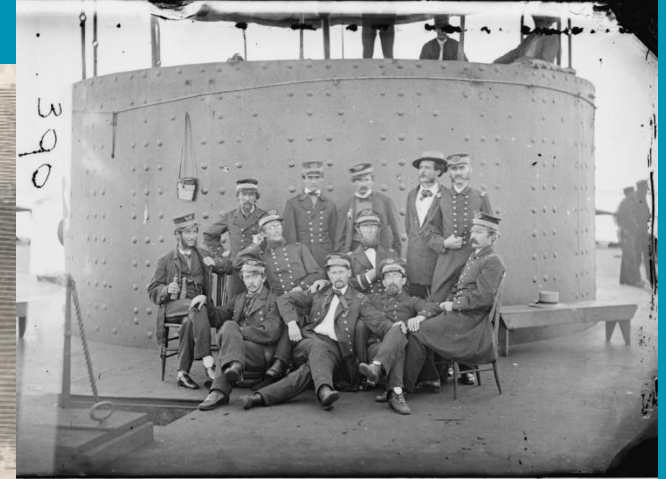
Discovery - 1973



NATHAN DENN

John G. Newton of the Duke University Marine Laboratory proposed testing the application of geological survey equipment for underwater archaeological survey and assessment.

History and Technologies Worth Preserving



National Oceanic and Atmospheric Administration

Designation

Whereas Title III of the Marine Protection, Research, and Sanctuaries Act of 1972, Public Law 92-532, authorizes the Secretary of Commerce, with the approval of the President of the United States, to designate Marine Sanctuaries; and, Whereas the wreckage of the U.S.S. Monitor has recently been identified; and,

Whereas it is the consensus of concerned organizations and individuals that the wreckage should be protected for its historic, cultural, and technological values; and,

Whereas the vessel has been placed on the National Register of Historic Places;

I therefore designate the site of the U.S.S. Monitor to be

The Monitor Marine Sanctuary

the area of which is to encompass a vertical section of the water column from the surface to the seabed and extending horizontally one mile in diameter from a center point located at 35°00'23" North Latitude and 75°24'32" West Longitude; and hereby affirm that the regulations promulgated according to the aforementioned authority will provide the necessary protection of law to preserve the esthetic values of this Historic Place.

January 30, 1975
Date



Frederick B. Dent
Frederick B. Dent
Secretary of Commerce

The *Monitor* National Marine Sanctuary was established by Congress on January 30, 1975, the 113th Anniversary of the *Monitor's* launching at Greenpoint, NY.

Recovery and Archaeology



USS Monitor Mosaic

Monitor Collection, NOAA

Recovery and Archaeology



Once the sections of deck and armor belt were removed....

....the turret was partially excavated to reduce the lift weights.



Monitor Collection, NOAA

Human Remains



Monitor Expedition 2002 – Turret Recovery



August 5, 2002 5:47 PM

Joint POW/MIA Accounting Command (JPAC)

(Central Identification Laboratory)
Hawaii

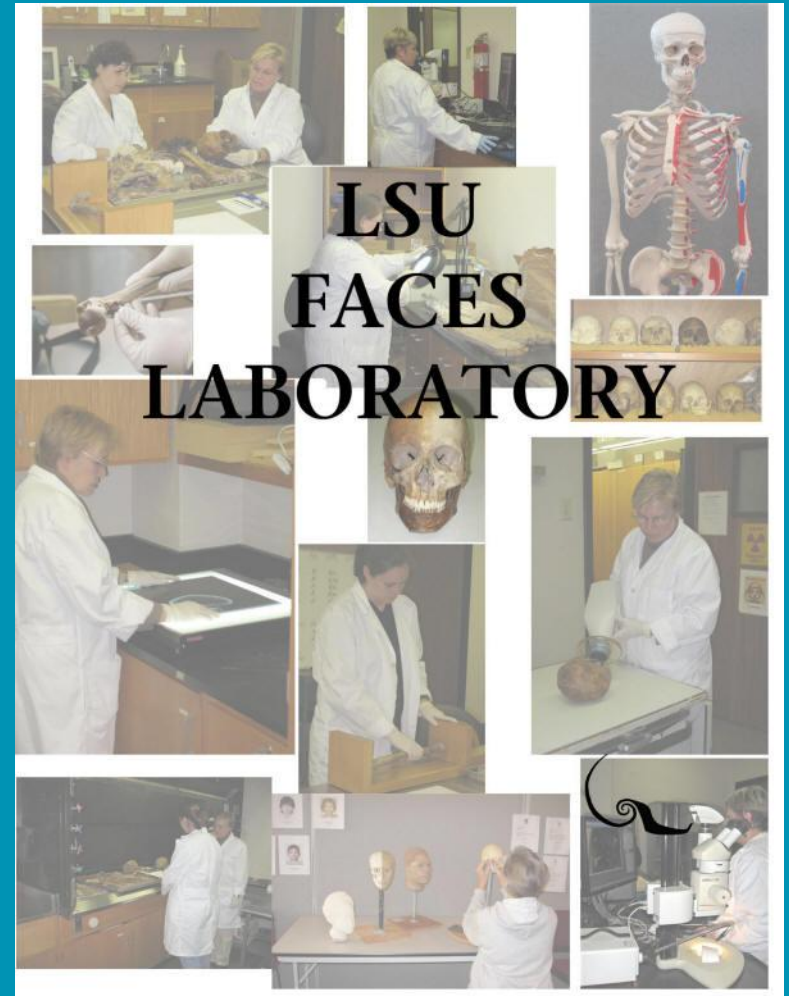


(Forensic Anthropology and Computer Enhancement Services)

A portrait of a woman with short brown hair, wearing black-rimmed glasses and a dark top. She is smiling and looking directly at the camera.

Nicole Del Harris

Forensic Anthropologist







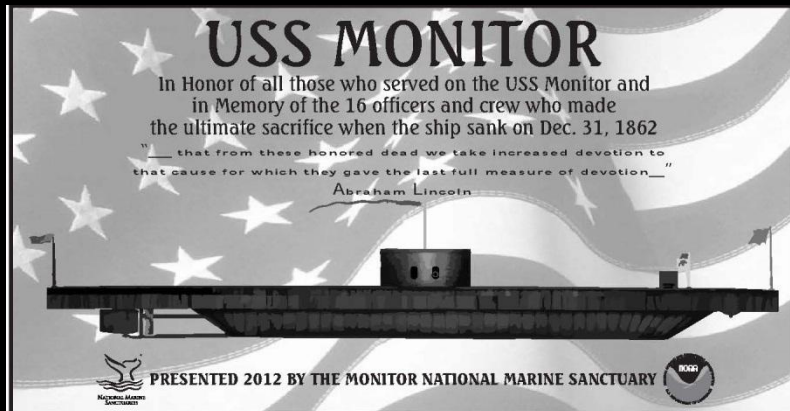


<https://www.youtube.com/watch?v=-jFt4k35DIQ>





US Navy Memorial Museum Washington, DC





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USS MONITOR Preserving a Legacy



Origin of the Monitor - Life on Board - Monitor Today - Education - News & Events

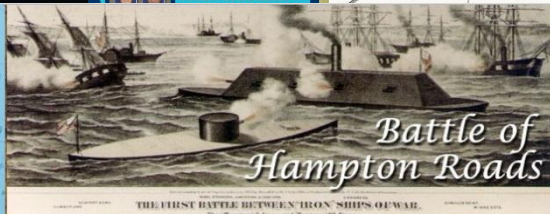
USS MONITOR CREW

First Look at the Monitor Crew
Forensic reconstructions

150th ANNIVERSARY
USS Monitor



CSI Monitor
Forensic experts recreate the faces of the USS Monitor's sailors.



Battle of Hampton Roads

THE FIRST BATTLE BETWEEN IRON SHIPS OF WAR



1862 - 2012



Lt. John L. Worden commanded the USS Monitor during the Battle of Hampton Roads. During the battle, he was looking through viewing ports in the Monitor's pilot house when a shell hit

USS Monitor Sailors to be Interred

On February 12, 2013, Secretary of the Navy, the Honorable Ray Mabus, announced that the two sailors recovered from the remains of USS Monitor are to be buried at Arlington National Cemetery on March 8, 2013, with full military honors.



Details...

Battle of Hampton Roads

Ordered to Hampton Roads, Va., the USS Monitor met the CSS Virginia on the morning of March 9, 1862. The battle was the first battle between ironclad ships.



Painting of the USS Monitor and the CSS Virginia in Hampton Roads March 9, 1862. (Courtesy of the U.S. Navy)

into Hampton Roads that day, she proved her worth. The Virginia rammed and sank the USS Monitor. The fires started during the battle destroyed the Monitor's pilot house and gun turret.

With two men killed and nineteen wounded, the Virginia steamed to Sewell's Point. The smoke stack was pierced, her boat and anchors were shot away, and she had a leak from where her iron prow had broken away. Although she was a little worse for wear, her armor had proved impregnable, verifying once and for all the great superiority of iron over wood.

As the Monitor anchored at 9:00 PM, Lt. Worden, Monitor's Captain, was ordered to defend the Monitor. The brightly burning Monitor lit up the night sky and provided a beacon that guided the Monitor towards the CSS Virginia. The atmosphere of gloom pervaded the scene.

An atmosphere of gloom pervaded the scene.



The Lost Monitor Boys

The Lost Monitor Boys

[The Lost Monitor Boys | Discovery of Remains](#)

On December 31, 1862, 16 men perished that stormy night off Cape Hatteras, N.C. Official reports of the incident listed as lost. The Rhode Island brought onboard the remaining crew members. As the Rhode Island with the survivors, the ship began the journey back to Hampton Roads.

Upon arriving at Fort Monroe, the survivors rushed to their families and friends that they were safe. George Geer's letter to his wife was brief and bereft of detail:



Fireman George Geer, (Monitor Collection, NOAA)

Dear Wife
I am sorry to have to write and what is worse we had can tell you I thank God we lost one boat that was semen [sic] in is missing them, and have given the you any more, but do not Troy and let them know I

A second, longer letter went to Geer's brother, which had harrowing details of the sinking; details Geer wished to let his wife in order not to worry her. In contrast, William Keeler detail in his letter home, telling his wife "The Monitor is not the fire of the enemy failed to do, the elements have accomplished their work."

Who were the Lost?

After a complete accounting of the survivors, it was determined that four officers and 12 enlisted were among the missing. Among the enlisted personnel that perished, were three African-American sailors. Initial research conducted on the Caucasian enlisted personnel after each name.

Officers:

ATTWATER, Norman Knox, Act. Ensign
FREDERICKSON, George, Act. Ensign
HANDS, Robinson, Warden, 3rd Act. Ensign

USS MONITOR 150th Anniversary

Origin of the Monitor - Life on Board - Monitor Today - Education - News & Events



For Teachers

For Teachers

The Monitor National Marine Sanctuary aims to provide teachers with resources and training to support the 150th anniversary of the USS Monitor. You will find curriculum, lesson plans, and activities that will excite your students not only about the Monitor and the Civil War, but also about science and technology.



Sleuthing Through 1862

Students become detectives and use various clues to discover the identity of a sailor whose remains were discovered on a Civil War shipwreck.

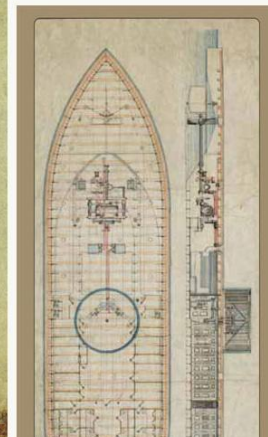


Lights, Cameras, Action

The Battle of Hampton Roads was one of the greatest battles in naval warfare. It was the first time iron met iron. In this activity, students discover how the USS Monitor and the CSS Virginia were developed, engineered and constructed, and learn the ultimate, long-reaching outcome of the Battle of Hampton Roads. Students will present their findings with supporting evidence in a music video created with Animoto or other media programs.



Don't forget to check out our [free stuff](#) like the bookmark you see below.



NOAA's Maritime Heritage Program



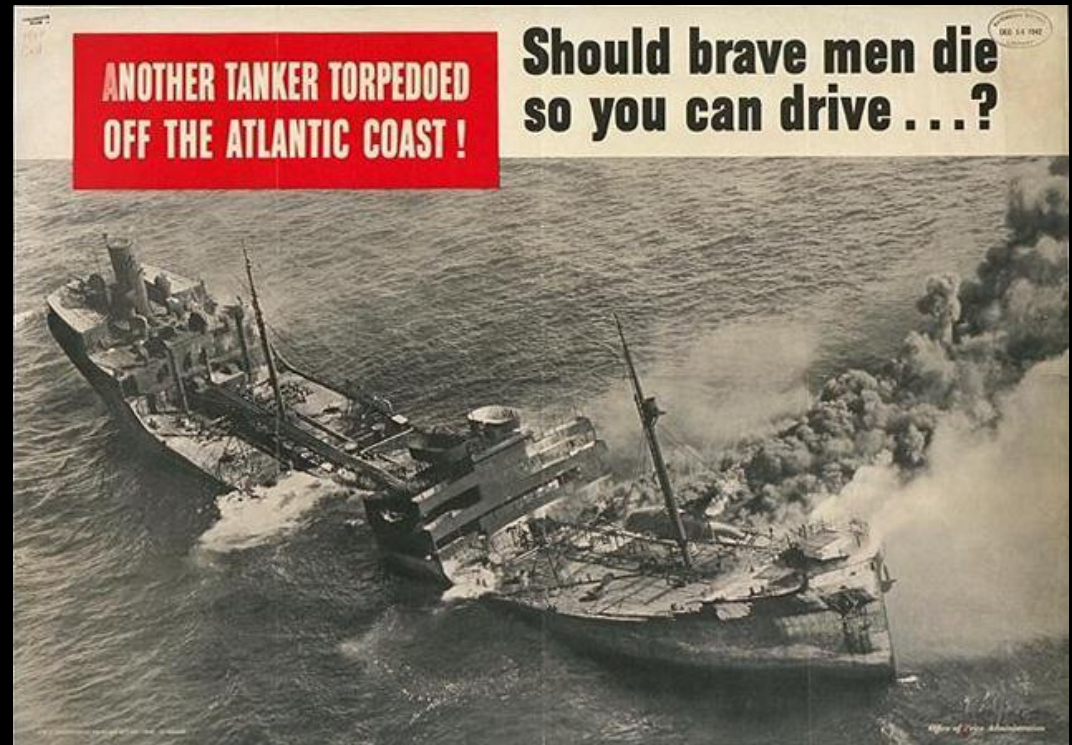
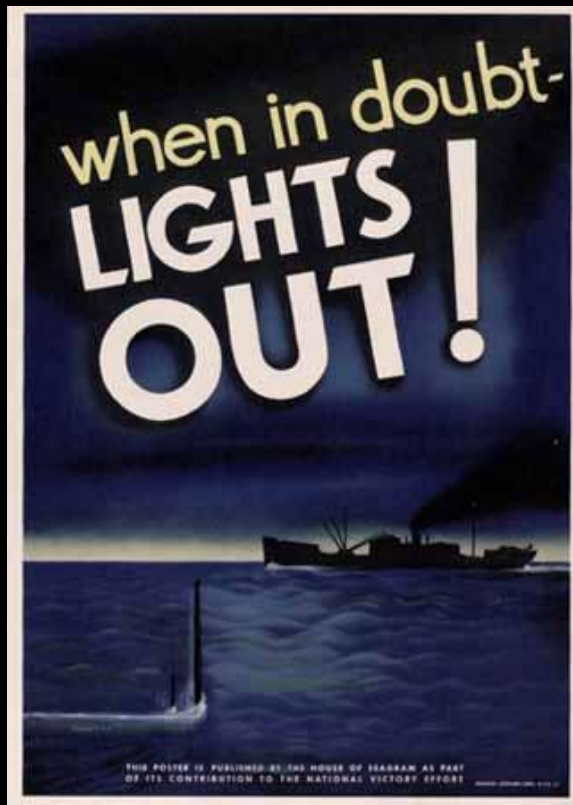
Battle of the Atlantic



WWII off the Coast of North Carolina

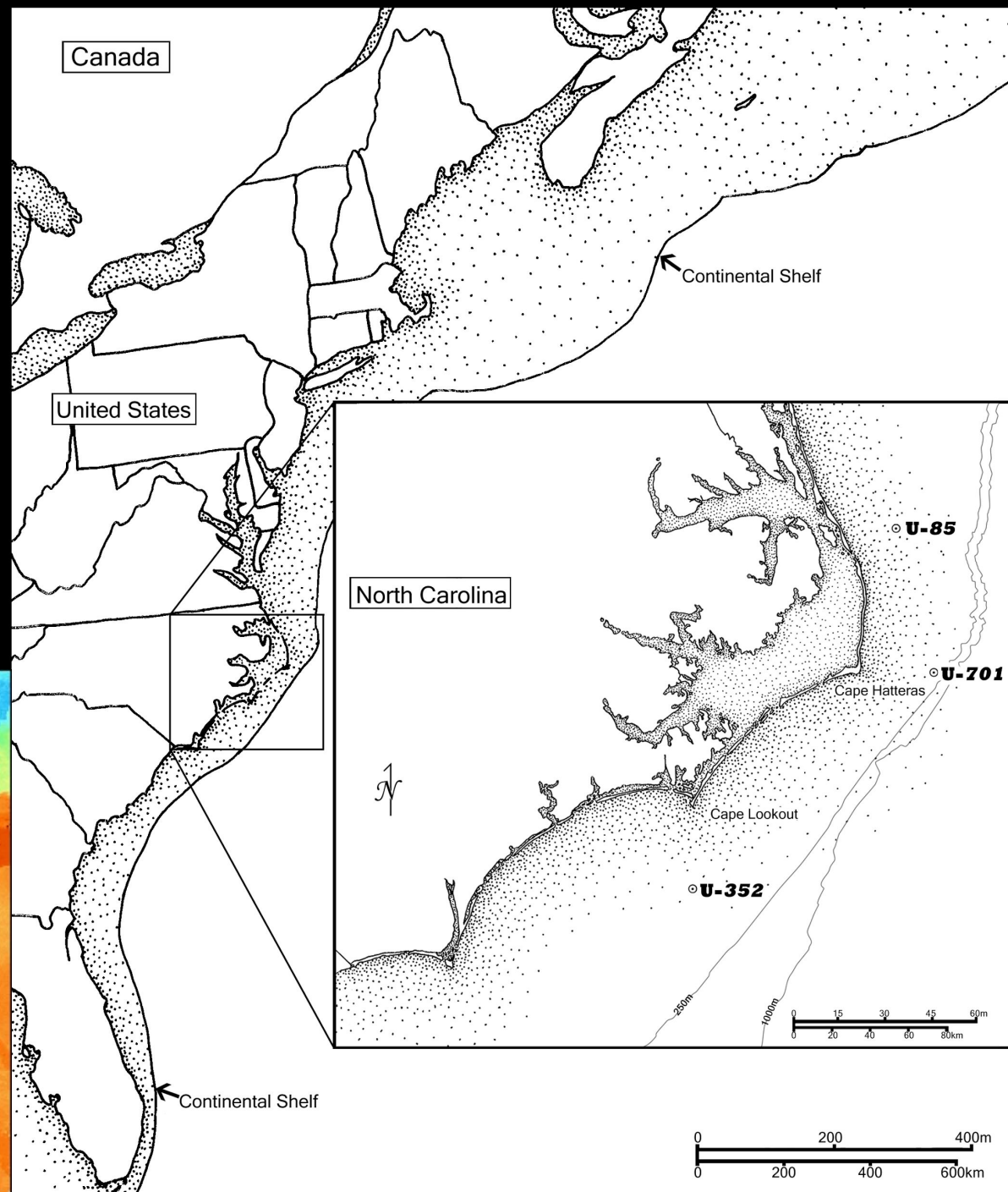
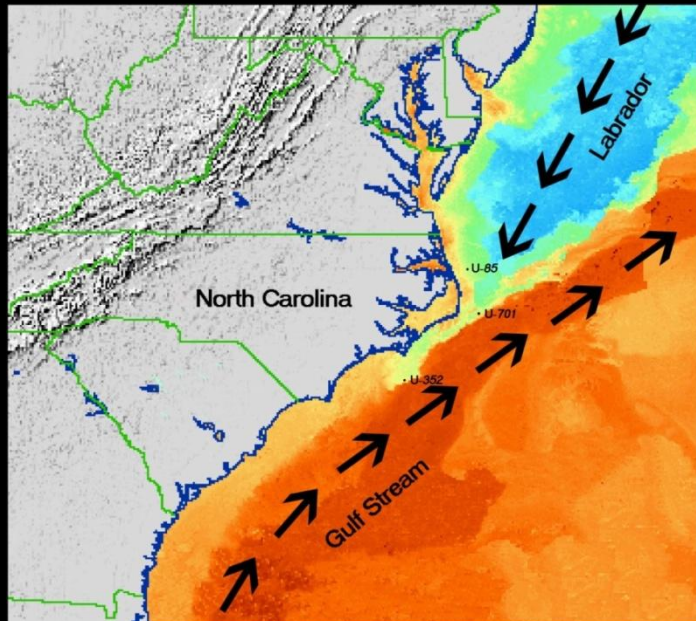
Battle of the Atlantic (1939-1945)

- Little known, but significant part of our national story
- U-Boats operated all along the Atlantic coast including the Chesapeake Bay
- North Carolina - Where the war came home

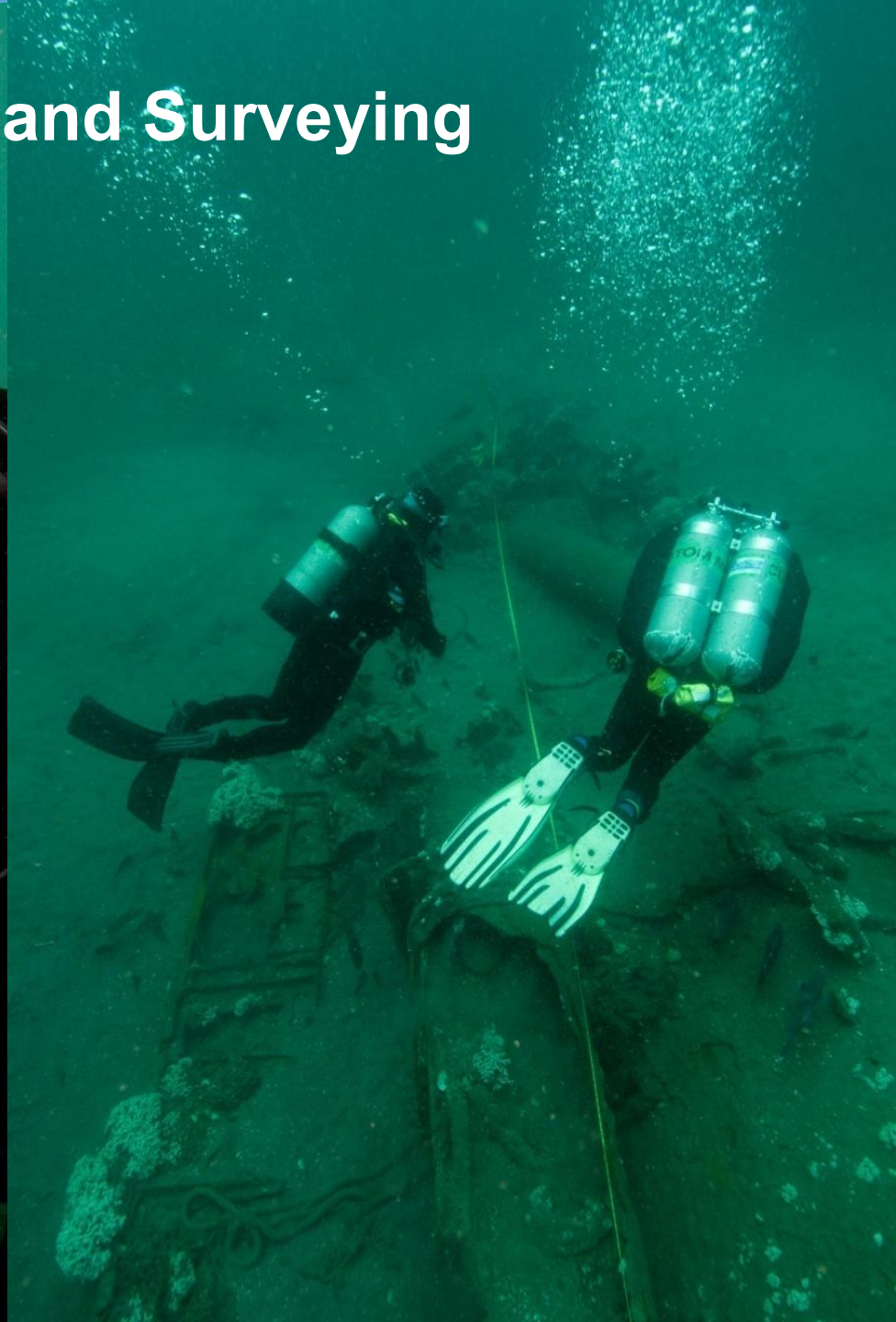


Significance of North Carolina

- Shipping Lanes
- Oceanic Currents
- Continental Shelf
- Water Depth
- Water Temperatures



Documenting and Surveying





U-701



U-85



U-352



Photomosaics



U-85

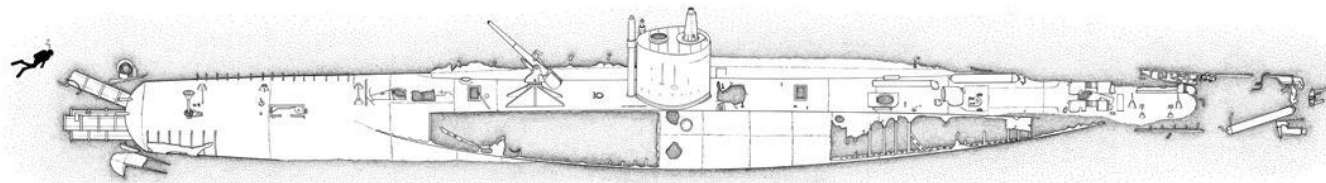


U-352

Site Plans

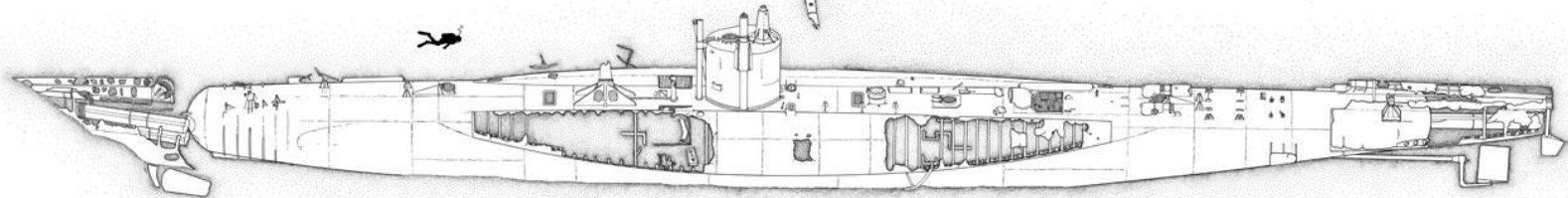
Battle of the Atlantic

2008 Archaeological Survey



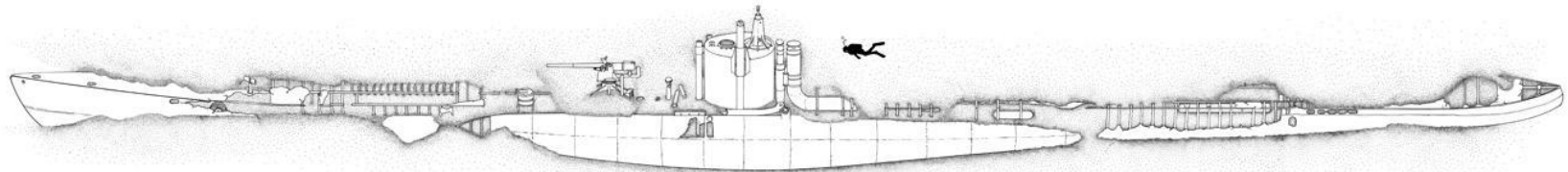
U-85

Type VIII - WWI German U-Boat
Sunk by the U.S. Navy's USS Roper
24 April 1942



U-352

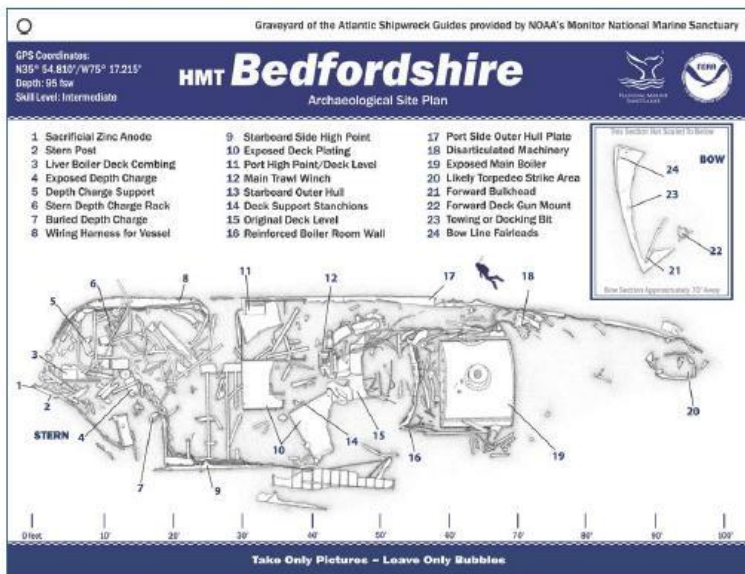
Type VIIC - WWII German U-Boat
Sunk by the U.S. Coast Guard Cutter Icarus
9 May 1942



U-701

Type VIIC - WWII German U-Boat
Sunk by U.S. Army Air Force Pilot Lt. Harry Kane
27 July 1942

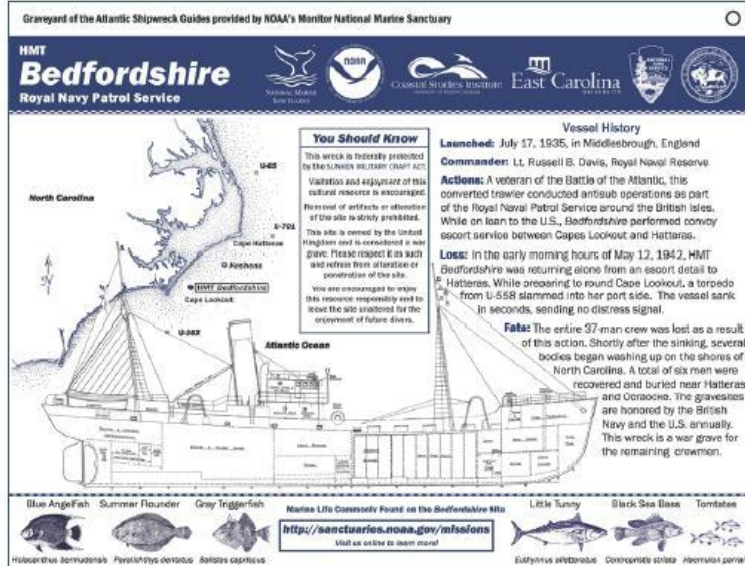
Drawn to Scale



Front and back of dive slate for British ship, HMT *Bedfordshire* that sank off the North Carolina coast in 1942. Image: NOAA

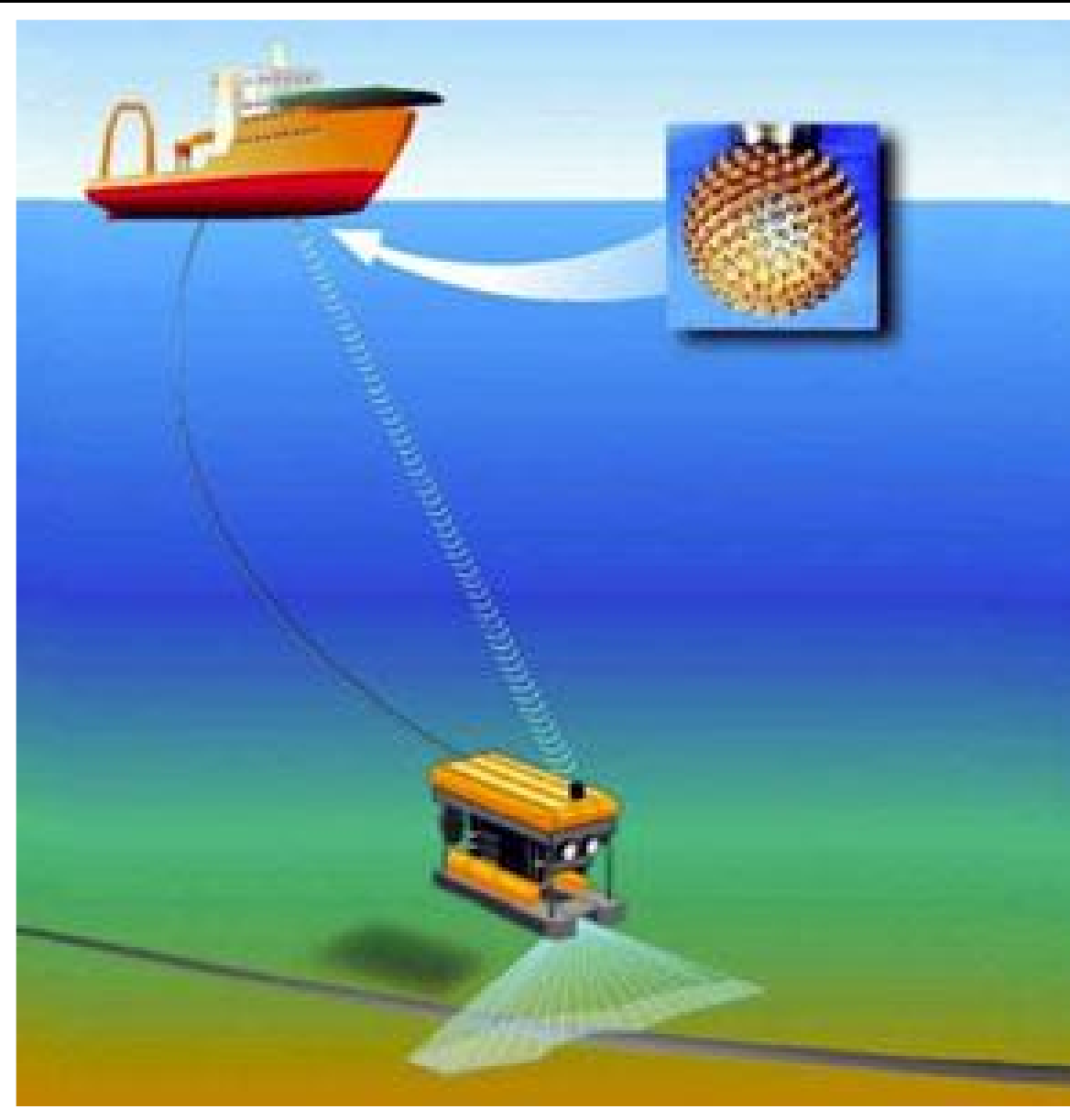
To request a hard copy of the dive slate or slates for U-85, U-352, U-707, or Keshena, email monitor@noaa.gov

Dive Slates

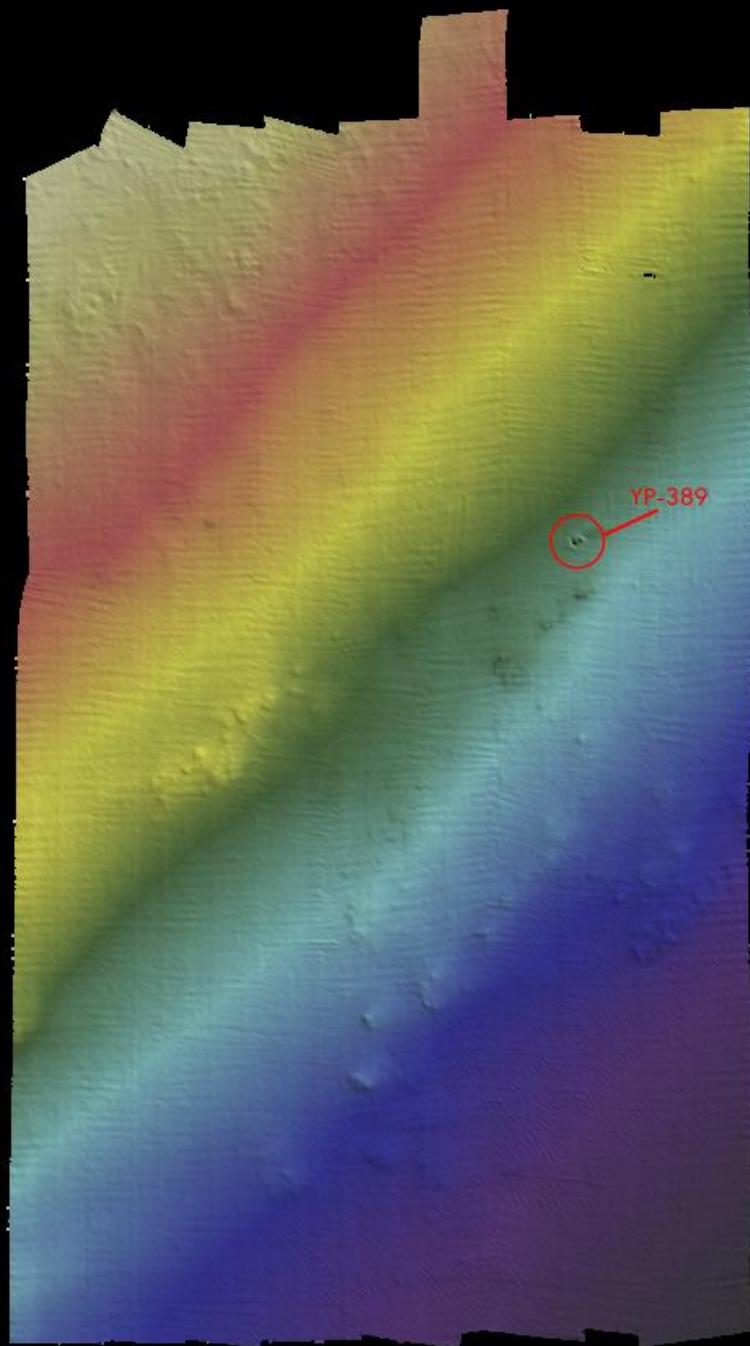
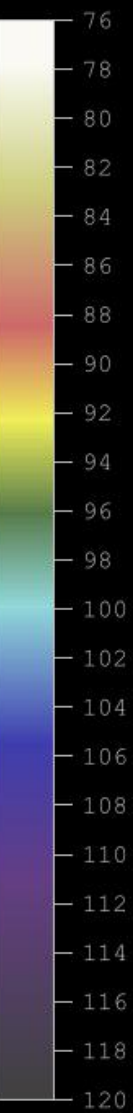


Technology

Multi Beam
Sonar on
an ROV

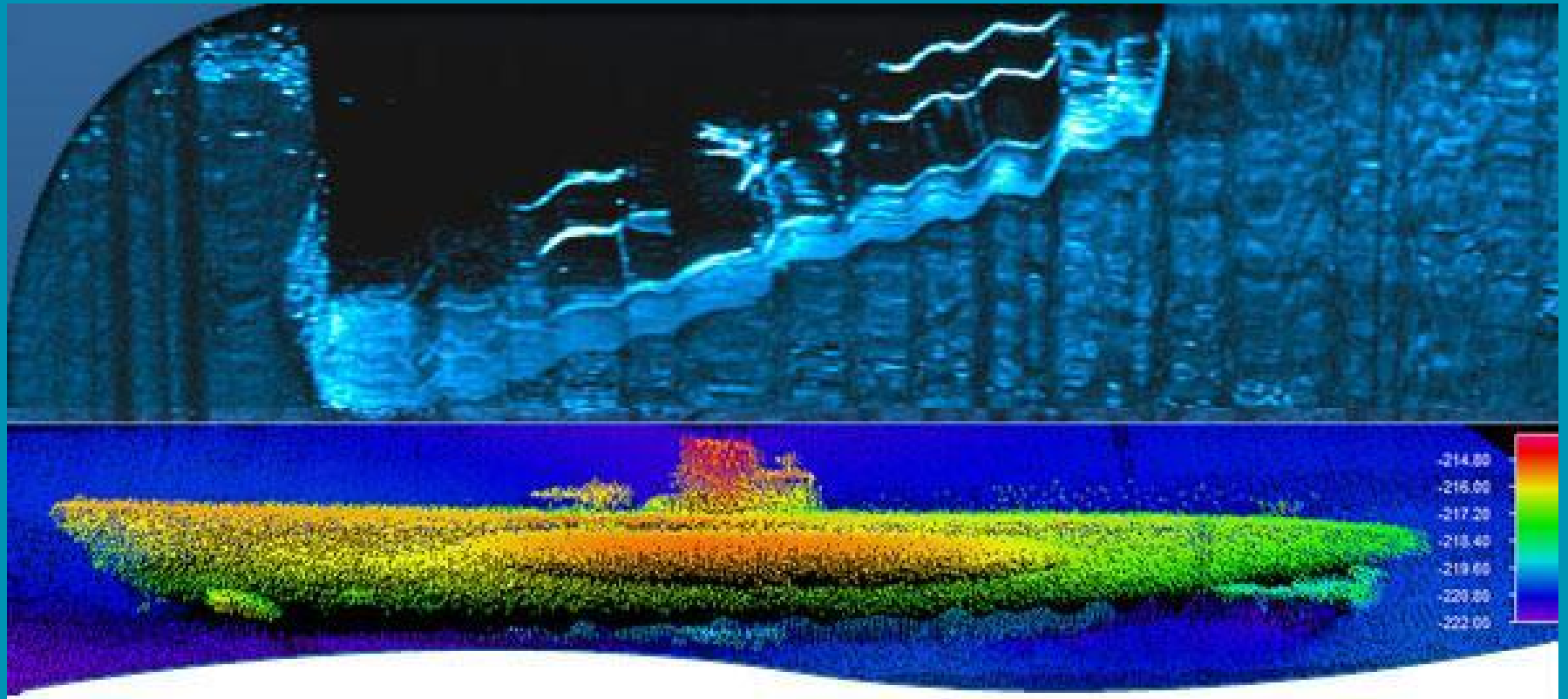


Multibeam sonar survey





Discovery of U-576 and *Bluefields*



*Maritime Heritage:
Shipwrecks of the Deep*

Project Based Learning

Crittenden Middle School



75% Black
17% White
6% Hispanic
2% Asian
1% Two or more races

68% Free or Reduced Lunch



Course Outline Development

Two Teachers

Semester Course

Maritime Heritage

Ecology / MWEE

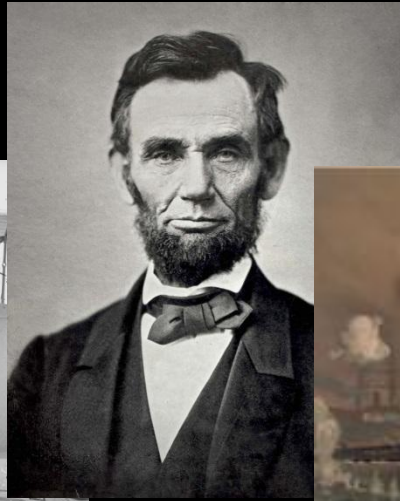
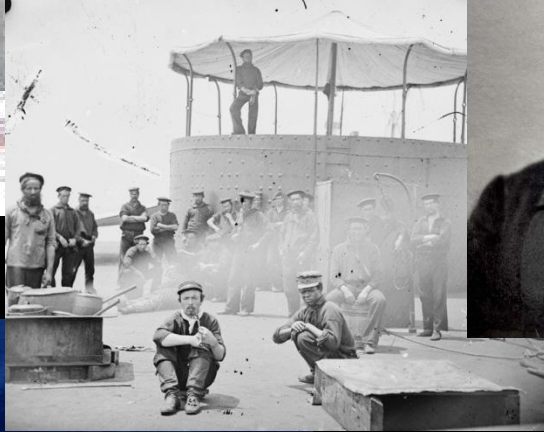
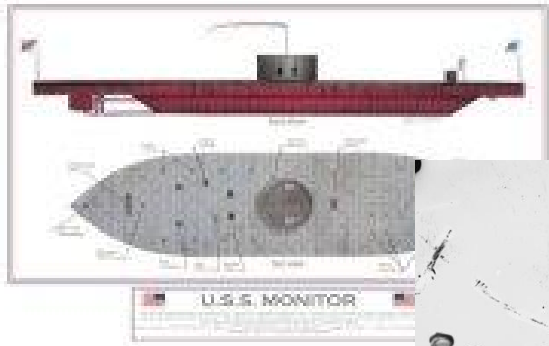


Crittenden Goals

Semester-length, Motivating
STEM Curriculum with Ecology
Service Project



Our Goals



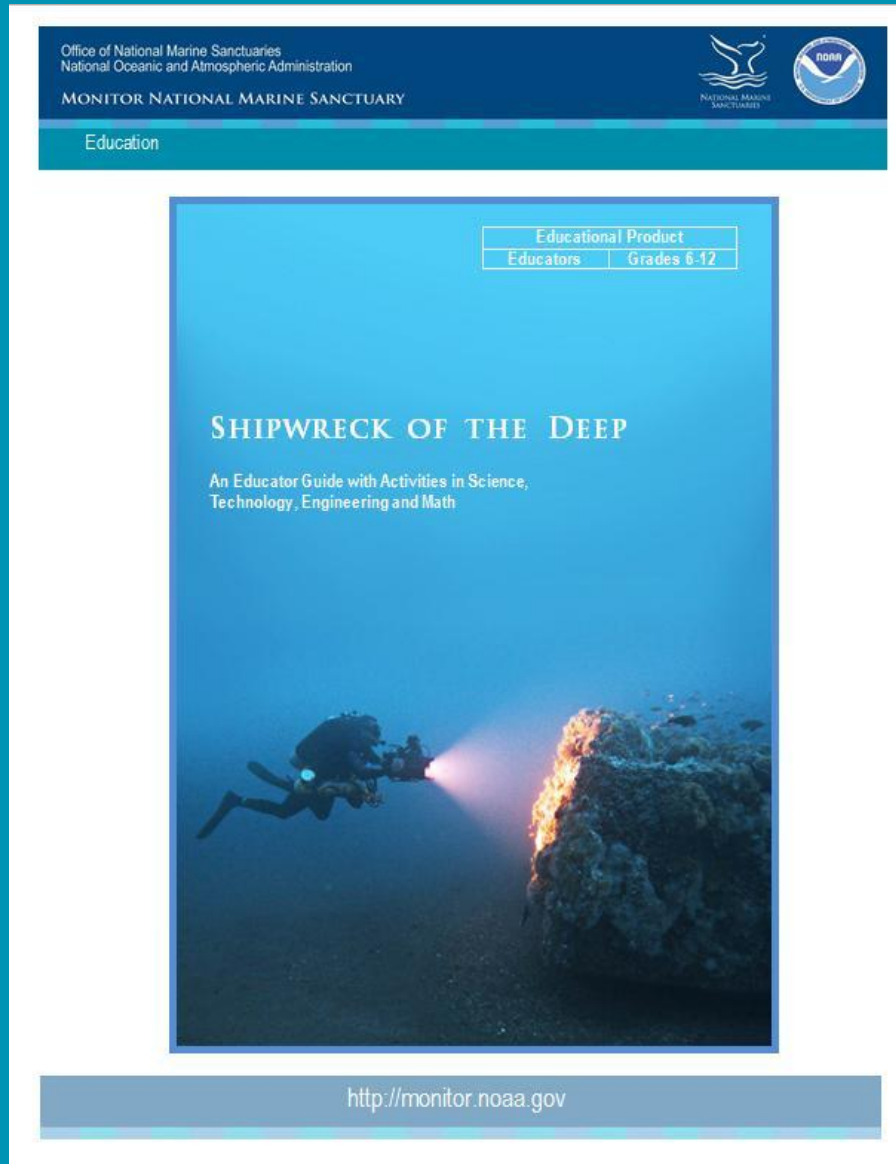
NOAA's Maritime Heritage Program



Integrated Curriculum

Three Sections:

- Maritime Heritage and Archaeology
- Life Science
- Chemistry of Conservation



Part I—Maritime Heritage

Monitor National Marine Sanctuary: SHIPWRECK OF THE DEEP

Activities and Worksheets

NOAA Who?	13
Explore the world of NOAA on the web	
Shipwreck Dilemma	15
Learn some of the ethical issues surrounding shipwrecks	
Searching the Deep	16
Simulate side scan sonar to locate a shipwreck	
I Can Name that Part in One Try	19
Identify the parts of a ship	
What Floats Your Boat?.....	20
Compete to build a boat with the most payload	
What's an ROV?	21
Explore ROVs and how NOAA uses them	
Envision an Engineer	24
Discovery the world of engineering	
Thinking Out of the Box	26
Try your hand at creatively solving a problem	
Help! We Could Use a Hand!	27
Become an engineer to design and build an arm for an ROV	
Engineering an ROV	29
Design, build, and test your own ROV	
It's All about Air	30
Teaching suggestions for properties of air	
Putting on the Pressure	31
Teaching suggestions for air pressure	
Buoyancy	32
Teaching suggestions for density and buoyancy	
Newton's in the Driver's Seat	33
Teaching suggestions for Newton's Laws of Motion	
Working Under Pressure	34
Friendly ROV competition	

Mock Shipwreck	37
Use math to document a shipwreck	
Puzzling Pieces	52
Create a photomosaic	
Reading the Record	60
Use source documents to uncover secrets of the past	
Sleuthing through 1908	64
Become a forensic anthropologist	
Ethically Speaking.....	70
Learn how shipwrecks increase tourism	



Maritime archaeologists and videographers dive on North Carolina's WWII shipwrecks. Photo: NOAA

Project-Based

Students simulate searching for a shipwreck while learning about maritime heritage and archaeology. They use primary source documents and images to identify the shipwreck.

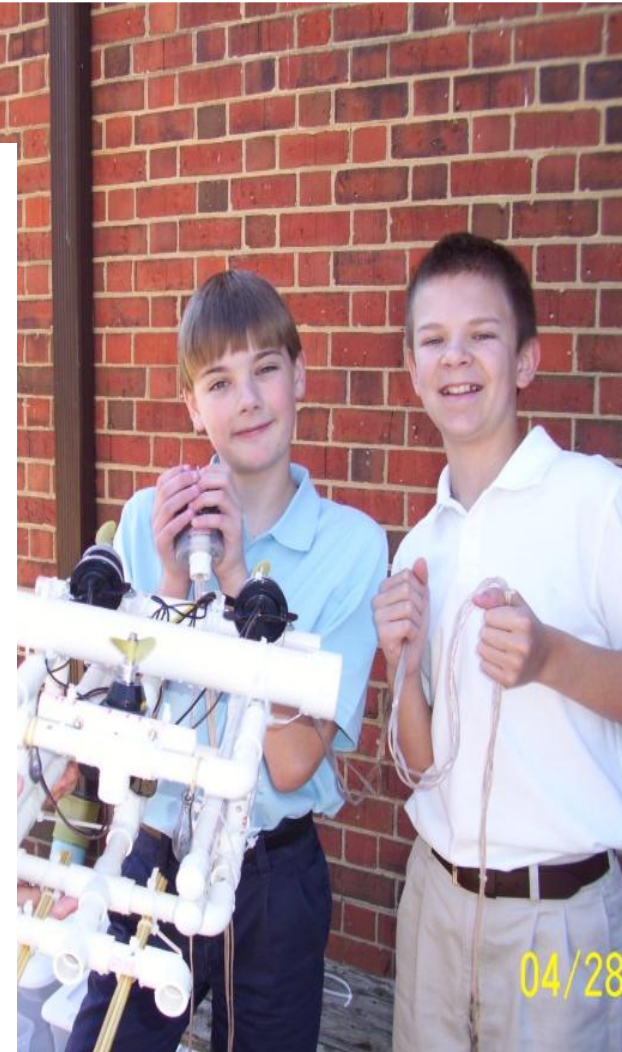


Students Simulating Searching for Shipwrecks and Engage in Engineering



Incorporating STEM into the Classroom

- Engineering Design
- Newton's Laws of Motion
- Buoyancy—Archimedes
- Principle





Mock Shipwreck Mapping Activity

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration



Education

Mock Shipwreck: Mapping the Past



Grade Level

- Grades 9 – 12

Timeframe

- 45 – 90 minutes

Materials

- Mock shipwreck tarp/outline
- Tape (scotch/duct)
- 30ft measuring tape
- Shorter measuring tape (enough for each pair/group of students)
- Clipboards (enough for each pair/group of students)
- Log Sheets (provided)
- Dive Slate (provided)

Key Words

- Maritime Archaeology
- Site Plan
- Baseline
- Scale Factor



Activity Summary

Maritime archaeology is a field of study that provides many career opportunities based in science, technology, engineering, and mathematics (STEM). The focus of this lesson is the creation of a shipwreck site plan. The students engage in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. The students make connections to maritime history, mathematics, and technology.

NOTE: Extension activities incorporate English language and social studies.

Learning Objectives

Students will be able to:

- Define maritime archaeology and describe its importance to our national maritime heritage.
- Employ measuring and scaling techniques to sketch drawings of a mock shipwreck to better understand how divers document an actual shipwreck.
- Determine the scale factor of their drawing in relation to the mock shipwreck.
- Make inferences about the mock shipwreck based on observations.

Background Information

During World War II, many battles were fought on foreign shores. However, few people know about those fought closer to home. The Battle of the Atlantic consisted of several skirmishes and decisive maneuvers between German U-boats and Allied and merchant ships all along the coasts of Europe and the United States.

The German U-boats were under orders to prevent merchant vessels from getting supplies to Allied nations. The United States deployed their own ships to act as defensive escorts armed with anti-submarine artillery. Many German and Allied and merchant ships fought and sank off the North Carolina and Virginia coasts.

The wrecks of these sunken ships still lie at the bottom of the ocean. It is the job of maritime archaeologists to find and study these links to our past in order to understand our history, conserve our heritage, and honor the memory of those who died defending our nation's future.



<http://sanctuaries.noaa.gov/education>

Pool Time



Puzzling Pieces

Materials:

Per Pair:

- Bag 1 of puzzle pieces
- Bag 2 of puzzle pieces
- cardstock
- *Parts of a Ship*
- *Dream Gazette*

Teacher Prep:

For each team, copy activity pp. 52-53.

For each team, copy diagrams on pp. 54-56. Cut along the dotted lines into small square pieces. Keep the pieces for each page together and place them in a zip lock bag. You will have four bags. Label bags accordingly: *Ship 1-A* (bow); *Ship 1-B* (stern); *Ship 2-A* (bow); and *Ship 2-B* (stern).

Copy *Parts of a Ship*, p. 57 and *Dream Gazette*, p. 58-59 for each team.

Extension:

Give students the ship pages and have them cut into their own unique puzzle pieces and exchange puzzles with another group.

Have students draw their own shipwrecks and create puzzles.

Reading the Records

Materials:

Per Pair:

- nautical chart
- ships' logs (4)
- colored pencils

Teacher Prep:

Make copies of the ships' logs and nautical chart for each student.

Old Weather Project

Under the leadership of the University of Oxford's Zooniverse Programme, the U.S. National Oceanic and Atmospheric Administration (NOAA), U.S. National Archives, UK Meteorological Office and Naval-History.Net are working with large numbers of online volunteers to transcribe historical weather data and naval events from the logbooks of United States ships in the 19th and 20th centuries. This includes ships of the United States Navy, U.S. Revenue Cutter Service, later the U.S. Coast Guard, and the U.S. Coast and Geodetic Survey. These transcriptions will contribute to climate model projections and will improve our knowledge of past environmental conditions.

<http://www.oldweather.org/>

Purpose: To explore tracing ships' movements and ship's log from a

Background

Ships' logs have record book of a the calculation of certain amount of record the speed

Today, the ship's or written. It is a conditions, times crewmembers, n sometimes even fail. It is also an the same way as cases involving r

Ships' logs also They might also record of valuable used to infer clin

In this activity, yo longitude coordin and use informal and site plan, to

Activity

1. Use a c
2. Connect
3. Repeat
4. Read the clues to
5. The ship
6. Write a crew, for

Log of Coast & Geodetic Survey Steamer Patuxent from 1914. PH NOAA

[http://](http://monitor.noaa.gov/)

Sleuthing Through 1908

Materials:

Per Group:

- 12 bags with artifacts and letters

Per Class:

- tub or small swimming pool filled with sand

Sailors of the USS Monitor

When the turret of the Civil War ironclad, USS *Monitor*, was recovered in 2002, two sets of human remains were discovered inside. In anticipation of human remains being found and due to the fact that the *Monitor* was a U.S. Navy vessel, the Joint POW/MIA Accounting Command (JPAC) was onboard.

With the help of Navy divers, maritime archaeologists, and JPAC, the remains of the two sailors were recovered and sent to JPAC for investigation. Personal artifacts recovered with the remains were sent to The Mariners' Museum for conservation.

On March 8, 2013, the sailors were laid to rest at Arlington National Cemetery with full military honors.

To learn more about the sailors, JPAC, the forensics, the recreation of their faces, and the burial, visit <http://monitor.noaa.gov/150th>



Casts of the USS *Monitor* sailors' skulls. Photo: Monitor Collection, NOAA



Cornelia B. Windiate. Photo: NOAA

Purpose: To collect clues, analyze and compare them and use source documents to draw conclusions

Background

In this activity, students read a story of a fictional ship, the *Betsy*, which sank in September 1908. In the story, 12 people perished with the ship, including the Captain's wife and son. Then the story jumps to 2013, when the shipwreck was found, along with human remains. Because the remains were not military, they were left *in situ*, but extensive documentation was done. A report was made to the company that had the legal rights to the ship, and later the next year, the company raised parts of the ship that included the remains. Forensic anthropologists conducted an investigation on the remains and attempted to identify them against records and DNA samples. Artifacts recovered also helped to identify the unknown.

Teacher Prep

The teacher will create 12 bags (one will be used with the tub of sand). Inside each small bag, place "artifacts" that help to identify the owners of each bag. Suggested "artifacts" are listed on the *Artifact Sheet* (p. 65), but you may substitute other items that might be more readily available. Just be sure to have the stories of each person match the items you place in the bag (e.g.—if the story says that a sailor had a wife and two children, then the photograph should be of a woman and two children). Search the Internet for images that match information. Write letters from sweethearts. (See *Sample Letters* p. 66.)

To model how to use artifacts to help identify unknowns, fill a large tub or small swimming pool about halfway with sand. Make sure sand is dry and not damp. In the sand, hide the suggested "artifacts" for, William Stuarts, whose remains have been discovered. Also in the sand, conceal some seashells and other ocean related items you might have on hand. To spark a conversation on marine debris, you may also want to put some marine debris, such as a soda can, into the sand. Ask the students if they had soda cans in 1908, and if not, then how did the can get there?

For each group of students, print story sheet, *The Demise of Betsy: A Fictional Story* (p. 69) and the activity sheet with the *List of Crew and Passengers* (p. 67). Go through the artifacts in the tub one-by-one, and have students review the story and the list of those onboard. Come to a consensus with the group as to the identity of the remains. Have students continue working independently with their group going through the artifacts in their bag to determine who once owned the bag.

***NOTE:** For realism, wear gloves as you handle the "artifacts."

<http://monitor.noaa.gov>

Part II—Life Science

Monitor National Marine Sanctuary: SHIPWRECK OF THE DEEP

Activities and Worksheets

Wrecks as Reefs.....	75
Shipwrecks act as artificial reefs	
Don't Spit on My Spat	76
Oyster lifecycle and how to measure spat	
How Does Your Garden Grow.....	77
Oyster restoration	
Where's the Water Shed?	78
Identify local water sheds and learn how they are affected by pollution	
Making the Point	80
Recognize nonpoint pollution	
Pollution Perils	81
Understand pollution sources	
Millions or Billions	83
Learn about ppm and ppb	
Testing, Testing, 1, 2, 3	85
Water quality testing	
To DO or Not to DO	86
Learn about dissolved oxygen	
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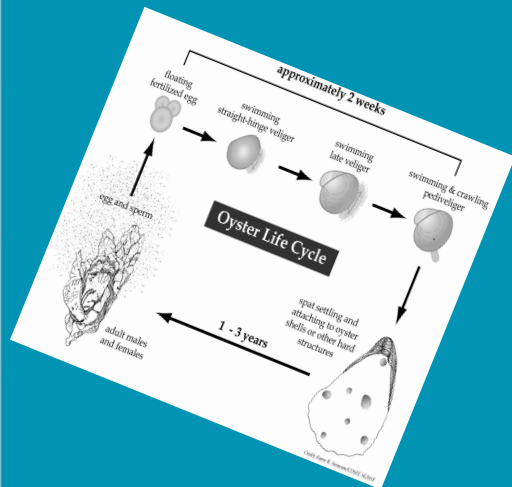
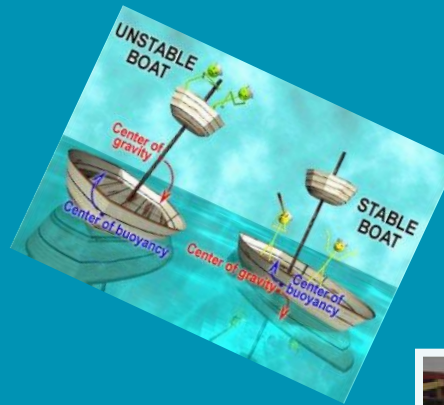
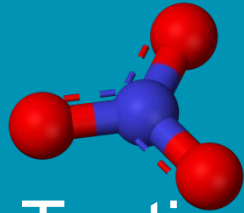


Oyster restoration at Jockey's Ridge, N.C. Photos: NOAA

Students build an observation buoy and learn about water quality in order to determine if the shipwreck site is a healthy artificial reef.

Then they explore oyster gardening, grow spat, and do an oyster restoration project.

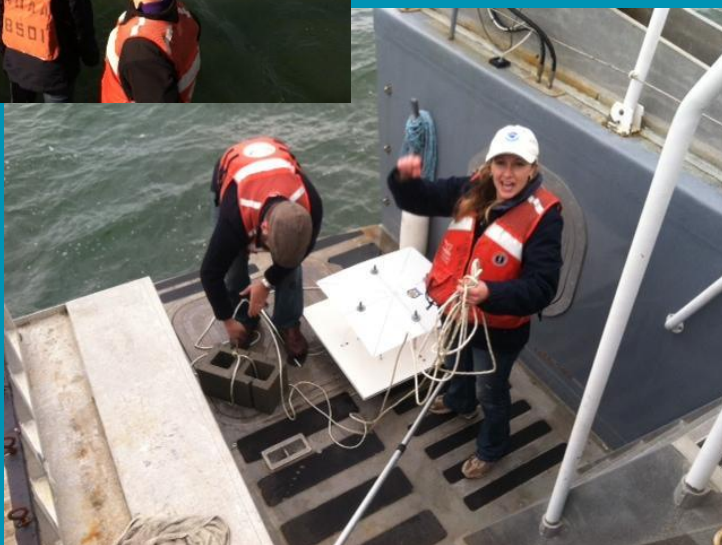
Wrecks as Reefs
Growing Oyster Spat
Water Shed
Pollution
Water Quality Testing
Basic Observation Buoy (BOB)
Oysters as Filters
Plankton Tow—Identifying Plankton



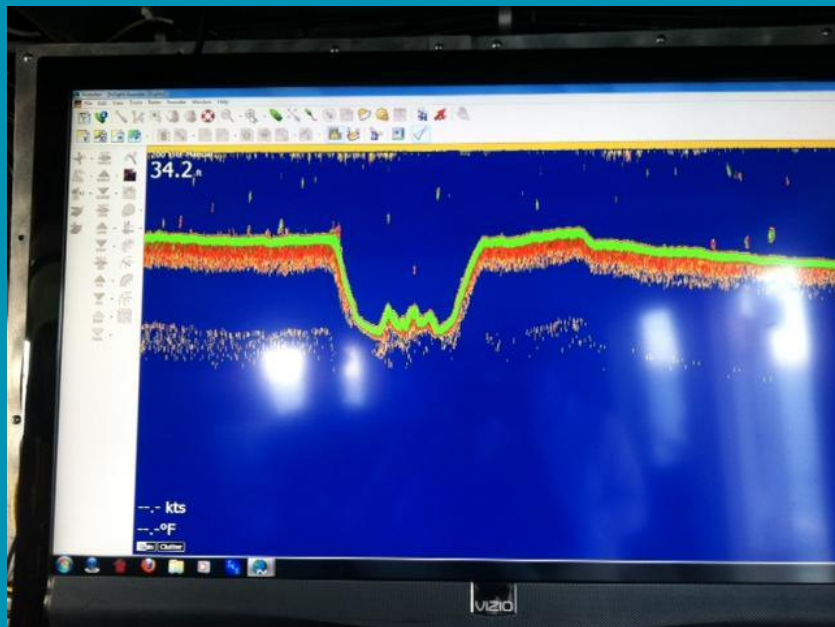
Built BOB



Deploying and Recovering Buoy from the SRVx *Sand Tiger*



Grant
Funded





Part III—Chemistry of Conservation

Monitor National Marine Sanctuary: SHIPWRECK OF THE DROP

Cole, Joanna: *Magic School Bus Shows and Tells: A Book about Archaeology*. Scholastic, 1996, ISBN: 0590922424.

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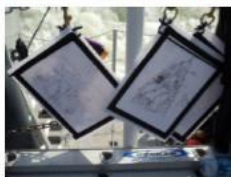
Oxade, Chris: *How We Use Metal*. Raintree, 2004, ISBN: 1410908933.

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Zronik, John Paul: *Metals*. Crabtree Publishing Company, 2004, ISBN: 0778714500.



Dive slates with site drawings Photo: NOAA

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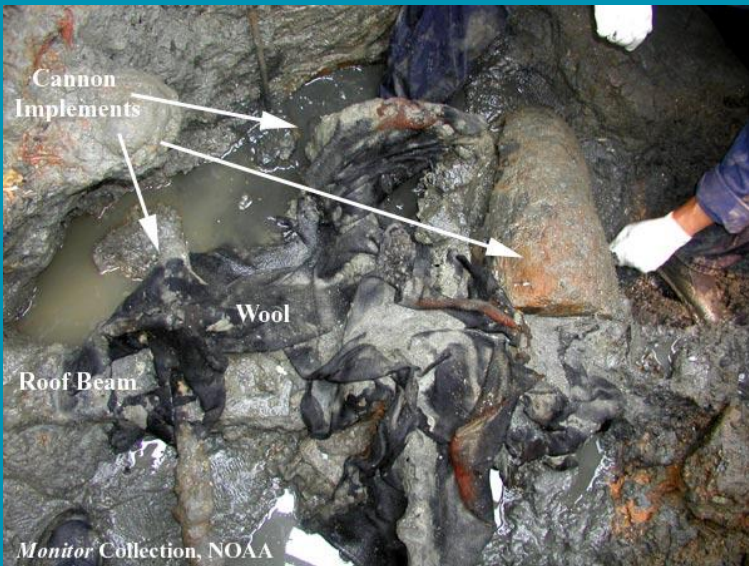


Volunteer diver helps NOAA to survey and document the Caribbean. Photo: NOAA

In the last section, students learn about conservation of artifacts and ethical practices.

As a culmination of the project, students hold a Socratic seminar and give their final decision to NOAA on what to do with the shipwreck.

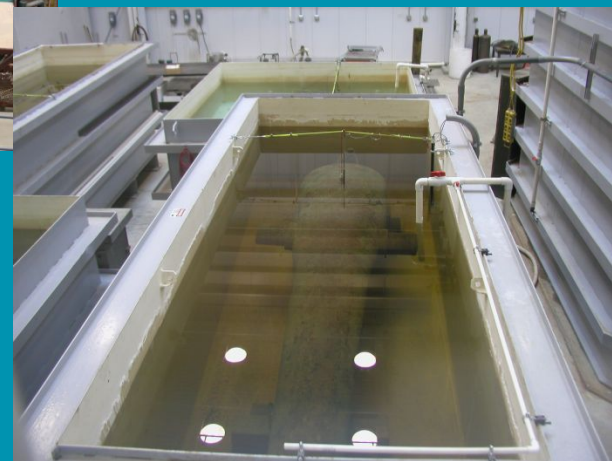
Artifact Recovery

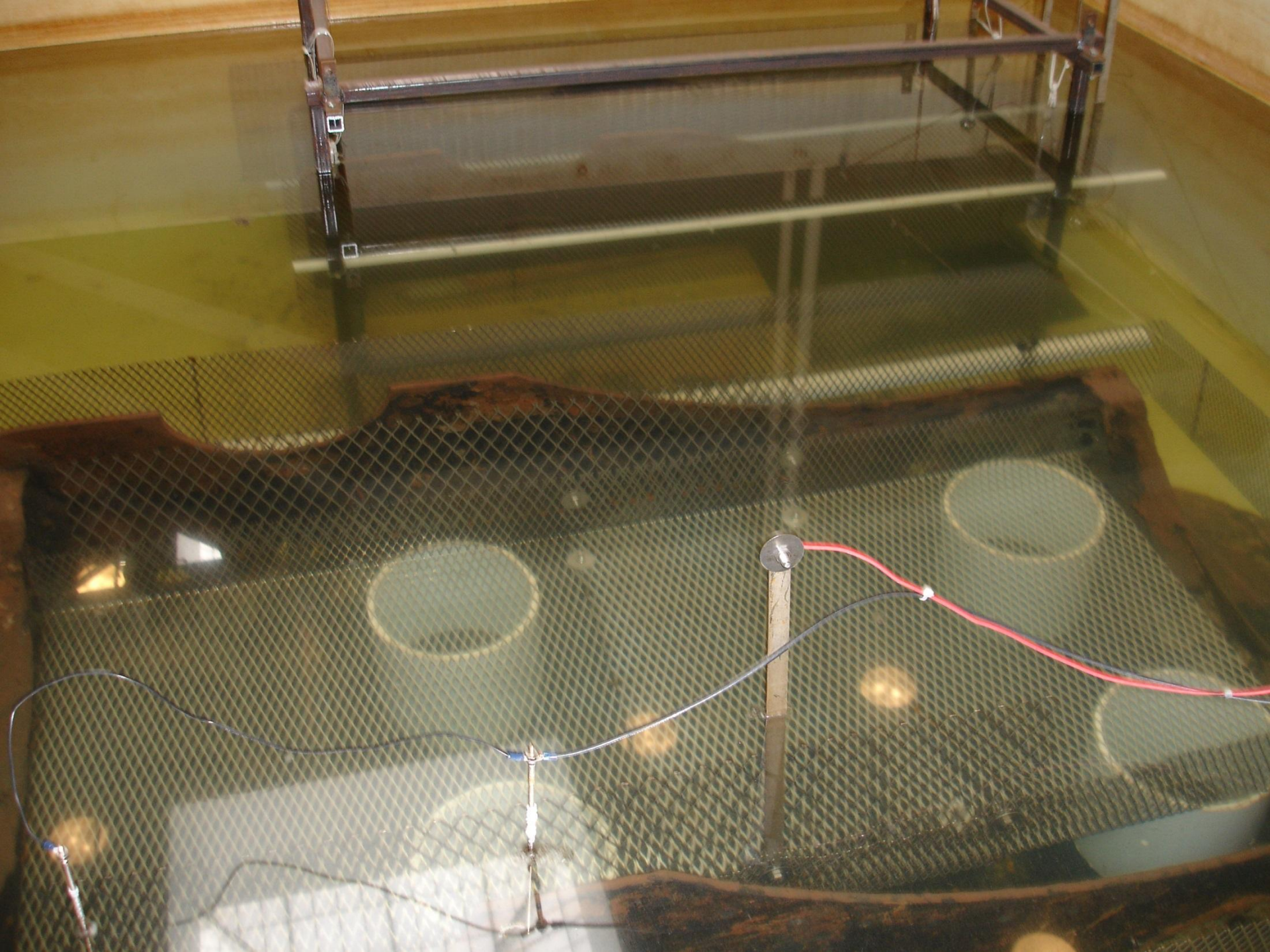


August – December 2002



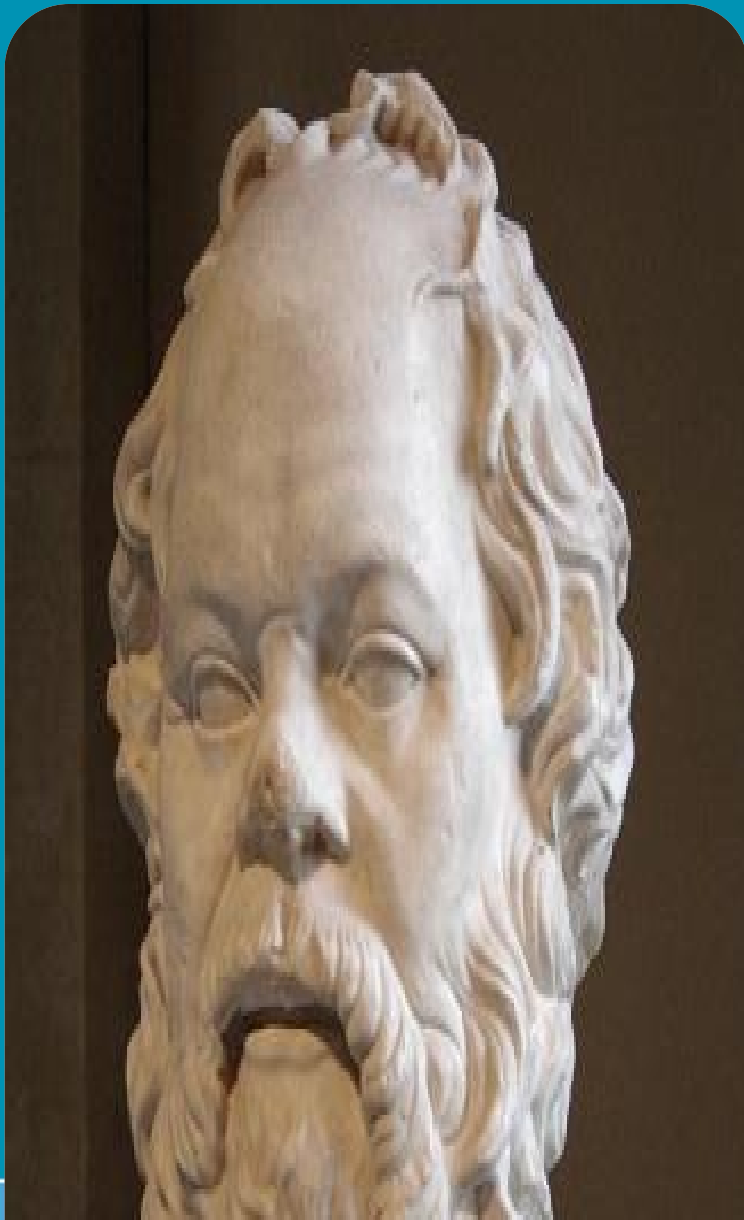
USS Monitor Center Batten Conservation Laboratory Complex











Socratic Seminar

Final Presentation

Maritime Archaeology:

*Discovering and Exploring
Shipwrecks*



Integrated Curriculum

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration
MONITOR NATIONAL MARINE SANCTUARY



Maritime Archaeology Discovering and Exploring Shipwrecks

Educational Product	
Educators	Grades 6-12



<http://monitor.noaa.gov>

- NOAA and MHP
- Ships through Time
- Maritime Archaeology
- Tools of Shipwreck Discovery
- Documenting Shipwrecks
- What's Next?

PROGRAM

This curriculum introduces the curriculum flows sequentially, from archaeologists, to understanding the curriculum in preserving our nation's heritage.

Although, this curriculum Each lesson can be used to create a tailored plan for your classroom.

We hope that you find heritage. Through a variety of math, and social studies, we welcome your feedback.



CURRICULUM OVERVIEW

- A. Course Introduction
 - 1) Introduction to the Monitor National Marine Sanctuary (ONMS), Monitor National Marine Sanctuary (MNP) and the Monitor National Marine Sanctuary
- B. Historical Significance
 - 1) Students learn about the time
 - 2) Understand the historical significance
 - 3) Appreciate our past
- C. Maritime Archaeology
 - 1) History of maritime archaeology
 - 2) Who's who in maritime archaeology

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

OBJECTIVES

Students will:

- Learn about NOAA
- Understand the importance of shipwrecks to our past
- Understand the importance of shipwrecks to our future
- Identify key people in maritime archaeology
- Dramatize and explore shipwrecks
- Recognize the importance of shipwrecks in our history
- Learn how shipwrecks are discovered
- Interpret how shipwrecks are discovered
- Learn the history of shipwrecks
- Discover how shipwrecks are discovered
- Learn about NOAA
- Identify and differentiate shipwrecks
- Model how maritime archaeology is conducted
- Construct a photograph of a shipwreck
- Analyze policy and procedure for shipwrecks
- Appreciate the importance of shipwrecks
- Evaluate the value of shipwrecks

SUGGESTED IMPLEMENTATION

1. Review
2. Review
3. Review
4. Once re
5. Have st

Vocabulary—General Vocabulary

archaeology—the study of the excavation and other physical remains of past cultures

artifact—any object made by a human being, whether cultural or historical in nature

AUV—Autonomous Underwater Vehicle

base line—a line serving as a point of calculation or location; a line from which triangulation is made

bio-historical poem—a type of line format and focuses on the lives of historical figures, such as explorers

bow—forward part of the ship; the part of the ship that is most forward when the ship is moving

buoyancy—the upward force that keeps things afloat

conservation—preservation of the natural environment and artifacts

conservator—a person who is responsible for the preservation of works of art, cultural or environmental objects

coordinate—a group of numbers that indicate the position of a point, line, or surface

in situ—to leave in its original position

grid—a network of squares used for excavation and recording

magnetometer—an instrument that measures magnetic forces; an instrument used to detect magnetic materials by their magnetic field

maritime archaeology—the study of human activities and rivers through the study of shipwrecks

multibeam sonar—emitting sound waves that produce a swath of sonar data

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

RESOURCES

Web Resources:

NOAA's Office of National Marine Sanctuaries
Discover the marine life a make up your nation's maritime heritage and the continuing efforts to protect our oceans.
<http://sanctuaries.noaa.gov>

Monitor National Marine Sanctuary
Visit this site to learn more about the Monitor National Marine Sanctuary and the continuing efforts to protect our oceans.
<http://monitor.noaa.gov>

NOAA National Ocean Service
Learn about side scan sonar and how it maps the ocean floor.
http://oceanservice.noaa.gov/mapping/how_side_scan_sonar_works.html

NOAA Ocean Explorer
Discover how NOAA uses various NOAA ROVs cum Hercules was built just for travel to depths of 4,000 feet.
<http://oceanexplorer.noaa.gov>

Exploring WWII: Battle of the Atlantic
For six years, maritime and other partners have documented shipwrecks off the North Atlantic. WWII's Battle of the Atlantic remains of German U-boats and the ships they sank. Learn about the shipwrecks first-hand through images.
<http://sanctuaries.noaa.gov/wwii.html>

Thunder Bay National Marine Sanctuary
With over 200 shipwrecks, Thunder Bay National Marine Sanctuary is a treasure trove for maritime archaeologists and divers. Visit the site for future study. Visit the site for future study. Visit the site for future study.
<http://thunderbay.noaa.gov>

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Book Resources

Adams, Simon. *Titanic* (DK Eyewitness Books). DK Children, 2009. ISBN-13: 978-0756650360.

Armstrong, Jennifer. *Shipwreck at the Bottom of the World: The Extraordinary True Story of Shackleton and the Endurance*. Crown Books for Young Readers, September 12, 2000. ISBN-10: 0375810498.

Baker, Beth. *Sylvia Earl (Just the Facts Biographies)*. Lerner Publications, January 15, 2006. ISBN-10: 0822534223.

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Ballard, Robert D., Rick Archibald, and Ken Marshall. *Ghost Liners: Exploring the World's Greatest Lost Ships*. Little, Brown Young Readers, September 1, 1998. ISBN-10: 0316080209.

Broadwater, John D. *USS Monitor: A Historic Ship Completes Its Final Voyage*. Texas A&M University Press, February 14, 2012. ISBN-10: 1603444734.

Cenullo, Mary M.: *Shipwrecks: Exploring Sunken Cities Beneath the Sea*. Dutton Juvenile, 2009. ISBN-13: 978-0525479680.

Gibbons, Gail. *Exploring the Deep, Dark Sea*. Little, Brown Young Readers, April 1, 2002. ISBN-10: 0316755494.

EDUCATION STANDARDS

The following pages list an overview of educational standards for

- ❖ National Council for Social Studies (NCSS)
- ❖ Common Core (CC)
- ❖ National Geography Standards (NGS)
- ❖ National Council of Teachers of English (NCTE)
- ❖ National Science Standards (Archived Standards from NSTA)
- ❖ Next Generation Science Standards (NGSS)
- ❖ Ocean Literacy Principles (OLP)
- ❖ National Mathematics Standards (NCTM)

This is not a comprehensive list, but indicates the standards that are the most prominent within the curriculum guide. The standards for each activity are listed on the first page of the activity in the blue box on the left at the bottom. See each standard for key to citing format in the activities (e.g. NCSS: US.ERA.9 FOR National Council of Social Studies, U.S. History, Era 9).

Jeffers, David. *Super Subs: Exploring the Deep Seat (Megatech)*. Crabtree Publishing Company, September 1997. ISBN-10: 0778700631.

Platt, Richard. *Eyewitness: Shipwrecks*. DK Children, June 1, 2000. ISBN-10: 0789458845.

Platt, Richard. *DK Eyewitness Books: Shipwrecks*. DK Children, 2005. ISBN-13: 978-0756610890.

Rose, Paul, Anne Laking, and Philippe Cousteau. *Oceans: Exploring the Hidden Depths of the Underwater World*. University of California Press, April 15, 2009. ISBN-10: 0520260287.

Smith, K.C.: *Exploring for Shipwrecks (Watts Library)*. Franklin Watts, 2000. ISBN-13: 978-0531164716.

Walker, Sally M. *Shipwreck Search: Discovery of the H. L. Hunley (On my Own Science)*. First Avenue Editions, November 30, 2006. ISBN-10: 0822564491.

Wall, Julia: *Mapping Shipwrecks with Coordinate Planes (Real World Math: Level 5)*. Capston Press, 2011. ISBN-13: 978-1429666176.

SEE INDIVIDUAL ACTIVITIES FOR ADDITIONAL BOOK RESOURCES

Education Standards Continued

National Geography Standard:

Error! Hyperlink reference not valid.

National Council of Teachers of English

<http://www.ncte.org/>

National Science Standards

Archived PDF:

<http://www.nap.edu/openbook.php?isbn=0309053269>

Next Generation Science Standards

<http://ngss.nsta.org/>

Ocean Literacy Principles

<http://oceanliteracy.wp2.coexploration.org/>

National Council for Social Studies

<http://www.socialstudies.org>

NCSS STANDARDS:

- Standard I—Culture
- Standard II—Time, Continuity, and Change
- Standard III—People, Places, and Environments
- Standard IV—Individual Development and Characteristics
- Standard VIII—Science, History, and Society
- Standard IX—Global Connections

NCSS HISTORY THINKING STANDARDS:

- Standard 1—Chronology
- Standard 2—Historical Context
- Standard 3—Historical Analysis and Interpretation
- Standard 4—Historical Research Skills
- Standard 5—Historical Perspectives

UNITED STATES HISTORY STANDARDS:

- Era 6—The Development of the United States
- Era 7—The Emergence of the United States
- Era 9—Postwar United States
- Era 10—Contemporary United States

WORLD HISTORY STANDARDS:

- Era 3—Classical Traditions (NCSS:WH.ERA.3)
- Era 6—The Emergence of the United States
- Era 8—A Half-Century of Change

Common Core

<http://www.corestandards.org/>

READING INFORMATIONAL STANDARDS:

- Key Ideas and Details
- Craft and Structure
- Integration of Knowledge and Media

WRITING GRADES 6-12:

- Write narratives... (L.6-12.1)
- Research to Build and Present Knowledge

HISTORY/SOCIAL STUDIES STANDARDS:

- Key Ideas and Details
- Craft and Structure
- Integration of Knowledge and Media

SCIENCE & TECHNICAL STANDARDS:

- Key Ideas and Details
- Craft and Structure
- Integration of Knowledge and Media

Education Standards Continued

National Mathematics Standards

<http://www.nctm.org/>

- **NCTM 6-8 Numbers and Operations** — Understand numbers, ways of representing numbers, relationships among numbers, and number systems (Computation, D)
- **NCTM 6-8 Numbers and Operations** — Understand numbers, ways of representing numbers, relationships among numbers, and number systems (Computation, A and B)
- **NCTM 6-8 Geometry** — Specify locations and describe spatial relationships using coordinate geometry and other representational systems
- **NCTM 6-8 Measurement Standard** — Understand measurable attributes of objects and the units, systems, and process of measurement (A, B, and C)
- **NCTM 9-12 Geometry** — Specify locations and describe spatial relationships using coordinate geometry and other representational systems (A and B)
- **NCTM 9-12 Geometry** — Use visualization, spatial reasoning, and geometric modeling to solve problems (A, B and D)
- **NCTM 9-12 Measurement Standard** — Understand measurable attributes of objects and the units, systems, and process of measurement (A)
- **NCTM 9-12 Process Standards** — Problem solving; Connections; Representation



Activities and Worksheets

Section A: NOAA and Maritime Heritage

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Conservation and Conservators155
Understand the complex process of conservation (*Exploring Conservation of Monitor's Turret, Rusting Away, Changing Metal*)

Six Sections

A: NOAA and Maritime Heritage

B: Ships Through the Ages

C: Maritime Archaeology

D: Tools of Shipwreck Discovery

E: Documenting Shipwrecks

F: What's Next?

Exploring NOAA



Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials

- Computer with Internet access or
- Printed resources

Activity Summary

This activity explores the many missions of NOAA, ONMS, Monitor NMS and NOAA's Maritime Heritage Program.

Learning Objectives

- To understand the important work that NOAA does to provide valuable information to those who need it.
- To learn about our nation's first national marine sanctuary
- To understand the importance of our nation's maritime heritage

Key Words

NOAA, ONMS, USS *Monitor*, national marine sanctuary, line office, maritime heritage

National Standards:

NCSS:1.a; NS.5-8.F; NS.6-12.F;
CCSS.ELA.LIT.R.6-8.1, 11-12.1;
NCTE:1

Background

Residing under the Department of Commerce, the National Oceanic and

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Monitor to the Rescue

As our nation's first national marine sanctuary, Monitor National Marine (MNMS) was established to preserve and protect our nation's first Civil War ironclad, USS *Monitor*. The *Monitor* and her brave crew helped to turn the Civil War and forever changed naval warfare when it fought the Confederate ironclad, CSS *Virginia*, also known as the *Merrimack*.

As the two ships fought in the Battle of Hampton Roads on March 9, battle also marked the first time that iron met iron and the age of the war came to an end. Another unique new invention that the *Monitor* ushered in was the rotating gun turret. The clever design gave warships more maneuverability in battle and became a standard on all future ships.

The *Monitor* did not see much action after the Battle of Hampton Roads. It was sent to support a small skirmish off Sewell's Point and it also participated in the Battle at Drewry's Bluff near Richmond. The crew, affectionately known as the *Monitor Boys*, spent most of their time in Hampton Roads waiting for a once again battle with the CSS *Virginia*.

On December 31, 1862, just 11 months after it launched from Greenport, N.Y., the *Monitor* encountered a storm off Cape Hatteras, N.C., and at night, sixteen brave men made the ultimate sacrifice. The *Monitor's* exact fate remained unknown until 1973, when John G. Newton and his team from the University Marine Lab, using side scan sonar, identified an unknown ship they thought was the *Monitor*. They confirmed its identity in 1974. Now, the *Monitor* is protected by Congress to protect this national treasure and on January 3, 2002, the *Monitor* became our nation's first national marine sanctuary.

In 2002, NOAA, in collaboration with the US Navy, raised the iconic gun turret. Navy divers were excavating the turret, they found the remains of a man. Once the turret was on the barge's deck, a second set of remains was found. The 150th anniversary of the USS *Monitor*, the Secretary of the Navy announced the discovery of the remains at Arlington National Cemetery on March 8, 2013. Today the pieces of the USS *Monitor* are conserved at The Mariners' Museum in Newport News, Va.

Photos Clockwise: John Ericsson, Battle of Hampton Roads, *Monitor* crew on deck, *Monitor* sinking, Turret being raised on August 5, 2002; Burial at Arlington National Cemetery of two *Monitor* sailors. Photos: NOAA's *Monitor* Collection



Section A

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

NOAA's Maritime Heritage Program

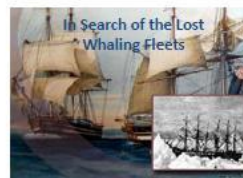
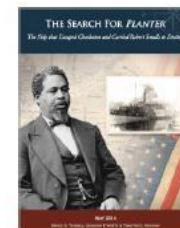
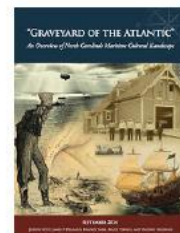
Museums of the Deep
Class Activity

Background

America's greatest museum of our past as a seafaring nation lies on the bottom of our nation's ocean, seas, lakes and rivers. They are places to explore, discover and appreciate our country's maritime cultural heritage. That heritage is a legacy of thousands of years of settlement, exploration, immigration, harvesting the bounty of the sea, and creating coastal communities and maritime traditions. Overall, it is an important link to our past and how we developed as a nation. Through NOAA's dynamic education and outreach programs, exhibits, visitors' centers and media, the importance of our unique heritage provide people with the knowledge they need to promote the preservation of these nonrenewable cultural resources.

In June 2000, the president recognized the need to increase ocean exploration and thus, he established the Office of Ocean Exploration and Research (OER). The office was created to coordinate the agency's exploration and research expeditions with the mission to enhance research, policy and management decisions, to develop new lines of scientific inquiry and to advise NOAA and the nation on critical issues. OER works with archaeologists, scientists, and oceanographers to explore the vast mysteries of our country's waterways.

Created in 2002, NOAA's Maritime Heritage Program is an initiative of the Office of National Marine Sanctuaries (ONMS). Each of our thirteen national marine sanctuaries and two marine national monuments, regardless of regulation and designation purposes, contain cultural resources. However, two sanctuaries, Monitor NMS and Thunder Bay NMS, were specifically designated to protect shipwrecks. Today through partnerships with the Office of Ocean Exploration and Research, other state and federal agencies and academia, the program continues to focus on maritime heritage resources within the National Marine Sanctuary System and promotes maritime heritage appreciation throughout our entire nation.



Sailing Through the Ages



Artistic rendering of a Viking ship.
Courtesy Gbioquendox00black

Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials

- Computer with Internet access
- Journal
- Rubric

Activity Summary

This lesson highlights the similarities and differences between ships through the ages.

Learning Objective

To develop a timeline of the construction of sailing ships

Key Words

See Vocabulary Box

National Standards:

NCSS:HT:1, 4, and 5; NCSS:I and II
CCSS.ELA.LIT.RI.1;
CCSS.ELA.LIT.W.2, 4; NCTE:1, 7, and 8

<http://monitor.nc>



Abandon Ship!



German U-boat, U-701, is located off the North Carolina coast. Photo: NOAA's Monitor NMS

Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials

- Computer with Internet access or
- Printed resources for students to use to prepare their media report

Activity Summary

This lesson explains the various reasons why ships sink. Using primary, secondary and tertiary sources, students will create posts, tweets, videos, or other news media to describe a shipwreck in history.

Learning Objectives

- To understand how and why ships wreck.
- To learn about some of the most famous shipwrecks
- To interpret the facts of a shipwreck and to disseminate the information to the public

Vocabulary

See Vocabulary Box

National Standards:

NCSS:HT:1, 2, and 4; CCSS.ELA.LIT.6-8.1, 2, and 3; CCSS.ELA.LIT.9-12.1 and 3;
CCSS.ELA.LIT.RH.1, 2 and 3;
CCSS.ELA.LIT.W.2 and 4; NCSS:I and II;
NCTE:1, 4, 5, 7, and 8

Background

Why do ships wreck? The shipwrecks, because many shipwrecks are even intact are often a common reason for anchorage and into danger break apart or to take on water off course causing them to

Other factors that make shipwrecks, piracy, mutiny, sabotage, if a shipwreck can be a hazard unknown and does not appear might not know his ship's location. However today, technology is dependent upon having power to work. And electronic charts onboard, charts can be unusable.

Another factor that caused many ships were sunk from torpedoes, or by numerous 1500 merchant ships were lost. It especially played a role in the coast.

The answer as to why shipwrecks has a unique story to tell. The *Titanic* and some never made it may seem to be, each on the ship or who had low gravesites for those who were relative perished at sea, then you learn about shipwrecks. Wrecks look for each ship's associated with it.

Activity Overview

In this activity students will research selected or assigned answer key questions and article, newscast video segments

<http://monitor.nc>

Section B

Past Connections



Two-masted schooner, Defiance, Thunder Bay National Marine Sanctuary. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials

- Computer with Internet access*
- Plastic tubs with sand and water
- Toothpicks and string
- Modeling clay and graph paper
- Various objects for artifacts

*Optional — Print web pages if no Internet or use other resources

Activity Summary

This lesson illustrates how artifacts offer historical information of the past.

Learning Objectives

- To describe types of artifacts found on ancient shipwrecks.
- To understand the valuable historical information artifacts offer
- To interpret the historical significance of artifacts and the importance of professional maritime archaeologists in their interpretation.

Key Words

See Vocabulary Box

National Standards:

NCSS:HT:1 and 4; NCSS:I, II and III;
NCSS:WH:Ero1.1a and 1.b; NCTE:1, 7 and 8;

Background

Humans, ships and the ocean have long been intricately bound together. Even in ancient times, ships provided the fastest and most economical method to move goods, people, and ideas from one place to another. However, the ocean can be an unforgiving place and some ships will inevitably wreck.

Shipwrecks offer an exciting window into the study and preservation of our past. They are a random sampling of voyages, a record of past trade and communication. It is almost as if they are frozen in time.

These submerged cultural resources give us a fresh perspective on history and are valuable classrooms offering a vast array of knowledge, beauty and heritage. The story of each shipwreck is woven into the intricate tapestry of its regional history. The preservation and research of sunken vessels provide a variety of information, such as the history of shipbuilding, a better sense of the physical development of the area, an understanding of innovations of the day, a look at the culture of the people on the ship, the identification of products that were coming into and through a region, the social structure in ship construction, and so much more.

Much of what we know about a region comes from historic documents, such as journals, newspapers, and first hand-accounts written in letters by those who lived during the time. However, shipwrecks contain a wealth of information that is not found in the documentary record. They help tell us what people did at a very specific moment in time. If a ship sank in 1200 BCE, everything onboard at the time of the sinking came from 1200 BCE or earlier. Clothing, tools, navigational instruments, cargo, personal items, and even the ship itself, tell us the story of how people lived and worked at that specific time in the past. If later items are found on a shipwreck, then they too tell another story. They offer clues as to what has happened to the ship since it sank.

Shipwreck exploration is a wonderful adventure, and underwater archaeologists are committed to studying the history on the ocean floor as well as preserving it for future divers. Protecting these resources allows for the continued interpretation and understanding of the lives of mariners and the struggles and successes they encountered.

Section C

Maritime Archaeology



Maritime archaeologist documents HMT Beothuk's boiler. Photo: Tane Casserley, NOAA

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials

- Internet (printed resources if Internet is not available)
- Worksheet pages

Activity Summary

This lesson highlights the development of maritime archaeology as a disciplined study

Learning Objectives

- To compare and contrast terrestrial and maritime archaeology.
- To create a timeline of the major events in maritime archaeology.
- To summarize and write succinctly.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:HT.1 and 4; NCSS:II, VIII;
NCTE:1, 7 and 8; CCSS.ELA.LIT.RL.1,
NS.5-8.F

Background

Archaeology is the study of the ancient and recent past through material a subfield of anthropology, the study of all human culture, archaeology of perspectives on human history and culture. Furthermore, archaeology helps us understand when and where people lived, as well as why and how they lived. Much of history relies on written records and documents to interpret the past. Archaeology allows us to go back in time even before written language. Through analysis of objects left behind, we are able to glimpse at what everyday life has been like in the past.

Underwater, maritime or nautical archaeology are terms to describe archaeology conducted under water. Although each discipline is slightly different from the others, they all basically study human interaction with the sea, lakes, and rivers through study of physical remains. Whether on land or in the water, the tools, techniques, and products for each location are essentially the same—although, different environments may require different tools, such as SCUBA gear. Nonetheless, the goal to understand the past is always the same—to connect to real people and everyday life including evidence of both the mundane and the extraordinary.

Although most people think of shipwrecks when they think of maritime archaeology, it is so much more. Today, maritime archaeologists study complete systems of the natural environment, referred to as the "maritime cultural landscape." Specifically, this consists of a combination of archaeological resources related to maritime activity, whether they are on land or in the water. Looking at the landscapes can encompass shipwrecks and associated sites on shore, such as docks and wharves, harbor and fishing structures, warehouses and shipyards, lighthouses, military forts, sites of religious significance and more. It also includes the natural geography of an area taking into account the coasts, routes, roads, and even the direction of prevailing currents and winds. Incorporating all of this into a place provides a perfect framework to assess the varied and extensive structures, sites, and material culture of a project area. Collectively, they form a complete story.

Maritime archaeology is important because shipwrecks offer a rare glimpse into the past, and contain information about the people and life onboard the ship. Shipwrecks are non-renewable resources, and once destroyed or disturbed, they are gone forever. Many factors can cause the disturbance or destruction of a shipwreck, such as storms, dredging, war, divers and more. Even an archaeologist recovering a site using careful scientific methods of archaeology, is causing a disturbance. However, it is important to study these microcosms of history to understand our past cultures. The information obtained from a site may cost of minimal disturbance. Moreover a deeper understanding of a culture allows us to learn more than we can from written history alone.

<http://monitor.noaa.gov>

Who's Who in Maritime Archaeology



Captain Barbara "Bobbie" Scholley, U.S. Navy (Ret.), during the expedition to recover the USS Monitor's gun turret. Photo: NOAA, Monitor Collection

Grade Level

- 6-12

Timeframe

- 4-8 hours

Materials

- Internet (printed resources if Internet is not available)
- Digital story software, PowerPoint, or other
- Worksheet pages

Activity Summary

Students conduct research to produce a digital story or multimedia presentation highlighting the people of maritime archaeology and shipwreck exploration.

Learning Objectives

- To research people who are significant in maritime archaeology and shipwreck exploration.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:HT.1 and 4; NCSS:II, IV and VIII;
NCTE:1, 7 and 8; CCSS.ELA.LIT.RL.1,
CCSS.ELA.LIT.W.2, 3, 4, 6, 8 and 9; NS-F

Background

With over three million shipwrecks resting on the world's seabed, much of human history lies hidden beneath the water. Until the 1960s, most shipwrecks were inaccessible to archaeologists. SCUBA diving was new and used only for commercial or recreational activities. Archaeologists had to depend on professional divers for information about a shipwreck. Furthermore, because professional divers were not trained in archaeology that information could never be counted as totally reliable. Then along came George F. Bass.

Bass started out as an English major at John Hopkins University, but while spending his sophomore year in England at the University of Exeter, he was suspended for pulling a prank. With nowhere to go, he went to Sicily with some friends for spring break, and there among the Roman theater with Mount Etna in the background, he thought about how great it would be to earn a living as a terrestrial archaeologist studying ancient cultures.

Bass soon began to realize that much could be learned from the many shipwrecks laying on the sea floor; and shipwrecks had advantages over terrestrial sites—they were not easily accessed by humans. In the 1960s, Bass began to apply rigorous excavation techniques to underwater wrecks. Along the way, he transformed underwater archaeology from an amateur's pastime to a modern scientific discipline.

Other early pioneers, such as Peter Throckmorton, who is often described as the "Father of Underwater Archaeology," helped to develop maritime archaeology into the discipline it is today. These early leaders led the way for the many secrets held beneath the waves to finally be revealed offering valuable insight into past cultures.

Activity Overview

In this activity, students will explore some of the great maritime archaeologists and shipwreck explorers of the 20th and 21st centuries. Using their research, students will create a bio-historical and acrostic poem and generate a storyboard. From their storyboard, students will create, produce, publish and present the biographical information they have learned using digital stories, PowerPoint, or other software.

<http://monitor.noaa.gov>

Searching the Deep



Divers survey a shipwreck. Photo: NOAA

Grade Level

- 6-12

Timeframe

- ~1 hour per activity

Materials

- See each activity for a list of materials

Unit Summary

This unit is divided into six individual activities that introduce students to the basic process of searching for a lost shipwreck and the tools used. Students learn about research, side scan sonar, ROVs, towfish, AUVs, magnetometers, science of SCUBA, and NOAA's ships and submersibles.

Learning Objectives

See unit overview for a list of objectives.

Key Words

See vocabulary for each unit section.

National Standards:

See individual activities for specific standards

Searching the Deep — Plotting the Course



U-576 Captain Hans-Dieter Heinicke (left). Photo: Ed Caram

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

- Activity Sheet: Plotting the Course
- Colored pencils
- Copy of Convoy KS-576
- Two copies of map

Activity Summary

This activity simulates the first stage of searching for a lost shipwreck—research. Students conduct research to narrow the search area of an underwater battlefield.

Learning Objectives

Discover how maritime archaeologists conduct research when searching for a shipwreck in order to narrow the search area.

Key Words

See Vocabulary Box

National Standards:

NG-1, 13 and 17; NCSS:1, II; NCSS:HT.2, 3 and 4; NCSS:WH.ERA.8.2B and 4B; NCTE:1, 3, 7 and 8; CCSS:ELA.LIT.RI.8.1; NCTM:6-8.G; NCTM:9-12.G.A, B; OL.6 and 7

Activity A

Battle of the Atlantic

Although World War II's Battle of the Atlantic has been extensively studied, Germany surrendered in 1945 in winning the war.

Once the U.S. entered WWII in 1942, their presence was irrefutable off Cape Hatteras, N.C., in air casualties in Torpedo Alley in roughly 50 merchant ships. Between Convoy KS-520 and archaeologists searched for the information will be obtained if it happened that day in July 194

Since 2008, the Monitor National Marine Sanctuary biological, and historical survey Carolina coast associated with researchers attempted to locate the same day. During this multi-federal and state agencies, after years of research and mapping located in the summer of 2014

When searching for lost ships, secondary and tertiary sources identified, NOAA maritime archaeologists search for the shipwreck, such as remotely operated vehicles (ROVs), towfish, magnetometers, and edge tools and the abundance helped to lead the way to protect

Activity Overview

In this activity students learn about shipwrecks. They look at primary sources to understand the importance of research on U-boat activity in sunken U-boats off the East Coast as they begin to simulate

Searching the Deep — Sonar Imaging



Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials per Group

- Prepared box—See Teacher Prep Section
- Masking tape
- Different colored pencils
- Graph paper (or use provided)
- Wooden skewer (~30 cm)

Activity Summary

Students will simulate how side scan sonar works.

Learning Objectives

- Use a coordinate grid system to map a simulated ocean floor
- To have an understanding of how side scan sonar works
- To learn how side scan sonar is used to locate shipwrecks
- To make inferences about the topography of an unknown and invisible landscape

Key Words

Echo; side scan sonar; topography

National Standards:

NG-1 and 3; NCSS:III and VIII; NCTE:1; CCSS:ELA.LIT.RST.7; NCTM:6-8.ND.D; NCTM:6-8.MS.A; NCTM:9-12.G.A and B; NCSS:HS-ETS1.B; OL.6 and 7

Section D

Activity B

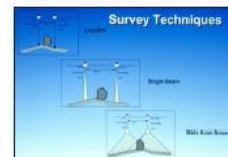
Side Scan Sonar

Side scan sonar is a specialized system to detect objects on the seafloor. Sonar is short for "sound navigation and ranging." Thus, sonar uses sound waves to locate underwater objects by measuring the time it takes for a transmitted sound wave to be reflected back to its source. The sound wave is transmitted through a transducer, which is comparable to a speaker in a radio. Side-scans use a transducer housed in a hollow container called a towfish that is towed through the water 10 to 20 feet above the bottom. The transducer emits sound waves to either side of the towfish and measures the time it takes for the waves to be reflected back to the towfish.

These sound waves are processed into an image that resembles an aerial photograph and can be viewed in real-time on a computer monitor aboard the towing vessel. A global positioning system (GPS) is used to guide the towing vessel along predetermined search paths, as well as to identify points of interest on the side scan image. This allows scientists to return to any point on the image for further investigation.

In a side scan, the transmitted energy is formed into the shape of a fan that sweeps the seafloor from directly under the towfish to either side. Typically, this distance is about 100 meters (~330 feet), but actual distance is based on frequency. The strength of the return echo is continuously recorded, creating a picture of the ocean bottom. Side scan sonar does not depend upon light and can be used under conditions that would make searching by divers dangerous or impossible. Because it covers a swath of up to 183 meters (600 feet) or more at about 2-4 miles per hour, it is a very efficient way to search large areas.

Experimental side scan sonar systems began during the 1950s by both the military and commercial industry. Dr. Harold Edgerton was a professor of electrical engineering at the Massachusetts Institute of Technology. He was intrigued with the unique challenges of underwater research and worked to design and develop many tools used in underwater exploration including side scan sonar. In 1973, he and John G. Newton from Duke University teamed together to see if side scan sonar imaging could be used to locate shipwrecks. Working off the North Carolina coast, the one ship that had a unique distinct "signature" was the USS Monitor. In August 1973, the team began to map the ocean floor in an area where they thought the Monitor might lay. On August 27, the side scan sonar recorded a "long amorphous" echo, and in April 1974, the location of the Monitor was verified for the first time in 112 years!



Left: Diagram illustrating survey techniques. Photo: NOAA

Right: First side scan sonar image of the USS Monitor, August 27, 1973. Photo: NOAA, Monitor Collection

<http://monitor.noaa.gov>

Searching the Deep — Roving Along



Researchers look out from the ROV, sending images from the ocean floor. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

Activity 1

- Internet

Activity 2

- 2-liter bottle
- Nail
- Duct tape
- Water

Activity 3

- 2-liter bottle
- Eyedropper
- Water

Activity Summary

To learn how ROVs, AUVs and towfish are used in maritime archaeology, and how increasing pressure at increased depths affect divers.

Learning Objectives

To describe how and why ROVs, AUVs and towfish are used in maritime archaeology.

Key Words

See Vocabulary Box

National Standards:

NG-1 and 17; NCSS:III and VIII; NCSS:HT CCSS.ELA.LIT.RH.7, NS-5-8.A, E and F; NS-9-12.B, E and F; NCSS:MS-PS4.A and NCSS:HS-PS4.A and C; NGSS:HS-ETS1.OL.6 and 7

Searching the Deep—Magnetometers



Crew prepares to deploy a magnetometer. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

Activity 1

- Small bar magnet
- Clear plastic box (petri dish works well)
- Iron filings

Activity 2

- 10-cm piece of plastic straw
- 2 straight pins
- Masking tape
- 30-cm of sewing thread
- Bar magnet with poles marked

Activity Summary

Students will observe a magnetic field and make a simple magnetometer.

Learning Objectives

To understand how a magnetometer is used to search for shipwrecks.

Key Words

magnetometer

National Standards:

CCSS:ELA.LIT.RST.4 and 7; NS-5-8.F; NS-9-12.B, E and G; NCSS:HS-PS4.B.C; OL.6 and 7

Activity F

SCUBA, SCUBA, SCUBA — DO!



Divers wait to dive on a shipwreck. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials

- Computer with Internet access
- Or printed resources for students to use to prepare their media reports

Activity Summary

This activity challenges students to use the format of modern social media technology to create a complete history of an important figure in SCUBA diving, while learning about the development of modern day SCUBA diving.

Learning Objectives

- To understand the development of SCUBA.
- To summarize the lives of famous divers using modern social media technology.

Key Words

See Vocabulary Box

National Standards:

NCSS:III and VIII; NCSS:HT.1, 2 and 4; NCTE:1,3, 4, 5, 6, 7 and 8; NS-5-8.E, F and G; NS-9-12.E, G; CCSS:ELA.LIT.W.4, OL.6 and 7

Searching the Deep — NOAA Vessels



SRVx Sand Tiger hosting an open house to showcase underwater archaeological research conducted off North Carolina's coast.

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

- Internet
- If Internet is not available, print copies of information needed to complete the activities

Activity Summary

Students will explore NOAA's fleet and small boat program.

Learning Objectives

To understand the types of NOAA vessels used in scientific research and to learn how small boats are used throughout U.S. waters to conduct research projects that protect our natural and cultural resources.

Key Words

Section D Continued

Activity E

NOAA Vessels

NOAA ships and aircraft play a critical role in the collection of oceanographic, atmospheric, hydrographic, and fisheries data. The NOAA fleet is managed and operated by the Office of Marine and Aviation Operations (OMAO), an office composed of civilians and officers of the NOAA Commissioned Corps. OMAO also manages the NOAA Diving Program and the NOAA Small Boat Program.

OMAO's research and survey ships compose the largest fleet of federal research ships in the nation. The fleet ranges from large oceanographic research vessels capable of exploring the world's deepest ocean, to smaller ships responsible for charting the shallow bays and inlets of the United States. The fleet supports a wide range of marine activities including fisheries research, nautical charting, and ocean and climate studies.

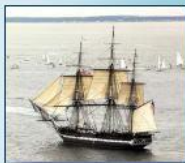
OMAO's aircraft operate throughout the world to perform a wide range of services including hurricane reconnaissance and research, marine mammal and fisheries assessment, and coastal mapping. NOAA aircraft carry scientists and specialized instrument packages to conduct research for NOAA's missions.

In addition to research and monitoring activities critical to NOAA's mission, OMAO ships and aircraft provide immediate response assistance for unpredictable events. Following Hurricanes Katrina and Rita, NOAA ships conducted emergency surveys for navigation hazards that helped Gulf ports reopen quickly. Aerial images of disaster-torn areas—taken by NOAA aircraft—enabled residents and emergency workers to verify the condition of houses, bridges and roads.

NOAA's fleet is divided into three regions: 1) Atlantic; 2) Pacific; and 3) Pacific Islands. The Atlantic Fleet has nine vessels: *Ronald H. Brown*, *Henry B. Bigelow*, *Ferdinand Hassler*, *Nancy Foster*, *Gordon Gunter*, *Okeanos Explorer*, *Thomas Jefferson*, *Oregon II*, and *Pisces*. The Pacific Fleet has five vessels: *Oscar Dyson*, *Roll M. Shimada*, *Rainier*, *Fairweather*, and *Bowditch*.

Section E

I Can Name that Part



USS Constitution Photo: U.S. Navy

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials

- Internet (optional)
- Books, articles and other resources for nautical terms

Activity Summary

This lesson helps students to learn the terminology associated with ships and to identify a ship's parts.

Learning Objectives

Students will learn the names of various parts of a ship, become familiar with nautical terms and their etymology, and learn the origin of phrases used today.

Key Words

amidships	keel
anchor	line
bow	mast
deck	port
fore and aft	starboard
hull	stem

National Standards:

NCTE:1 and 9; CCSS:ELA.LIT.RL.4;
CCSS:ELA.LIT.W.3;
CCSS:ELA.LIT.RH.4; OL.6 and 7

Background

Every profession has its own terminology and jargon, and sailing is no exception.

Putting the Pieces Together—Photomosaics

Photomosaic of the Monitor's turret.
Photo: NOAA's Monitor Collection

Grade Level

- 6-12

Timeframe

- 1 hour or less

Materials per Group

- Photomosaic image
- Scissors
- Tape

Activity B

- Digital camera
- Ability to print
- Scissors
- Tape
- Internet (optional)

Activity Summary

Students simulate how archaeologists document and survey a shipwreck.

Learning Objectives

To recognize the importance of archaeology in documenting shipwrecks and to simulate creating a photomosaic.

Key Words

See Vocabulary Box

National Standards:

NCSS:VIII; CCSS:ELA.LIT.RST.3;
OL.6 and 7

Background Information

How do maritime archaeologists study dive down to a wreck to observe and measure, they carefully document the shipwreck measurements, make drawings, and take photos.

When archaeologists make a carefully site plan. If archaeologists piece together they create a photomosaic. Photomosaics taken in sequence and then put together picture. Photomosaics are very useful in archaeologists can see exactly what the site looks like.

Sometimes when a shipwreck site, such as archaeologists cannot spend a long time operated vehicles (ROVs) to take pictures document a shipwreck site because the can stay on the bottom for a very long time.

In 1974, National Geographic and Monitor complete photomosaic of the wreck of the sunken ironclad were joined together site. The task of fitting all the images to the product provided invaluable information.

From the early 1990s to 2002, archaeologists Monitor, including the steam engine, the turret. With all the changes to the site, it was created to document the changes at 2006, MNMS worked with the University of North Carolina to create a new partial photomosaic to document and survey the site will be created.

Photomosaics are like snapshots in time archaeologists in studying the site, the capture details that are often unseen or forgotten.

Activity Overview

Students will simulate creating a photomosaic of the Monitor and cutting it into pieces and then students will also research and discuss important to document a shipwreck will be created.

Mock Shipwreck: Mapping the Past

Students map a mock shipwreck.
Photo: NOAA

Grade Level

- 6-12

Timeframe

- 45-90 minutes

Materials

- Mock shipwreck tarp/outline
- Tape (Scotch/duct)
- 30 ft. of measuring tape
- Shorter measuring tape (one for each group)
- Log Sheets (provided)

Activity Summary

This lesson engages students to map a mock shipwreck to create a site plan using scale drawings

Learning Objective

To understand maritime archaeology and describe its importance in preserving our maritime heritage. To measure and draw to scale. To make inferences based on observations.

Key Words

See Vocabulary Box

National Standards:

NCTM:9-12.G, M, NCTE:4 and 5; NS:5-8.E, F and G; NS:9-12.E and G;

Background

During World War II, many battles were fought on foreign shores. However, few people know about those fought closer to home. The Battle of the Atlantic consisted of several skirmishes and decisive maneuvers between German U-boats and Allied and merchant ships all along the shorelines of the Atlantic Ocean including the United States.

The German U-boats were under orders to prevent merchant vessels from getting supplies to Allied nations. The United States deployed their own ships to act as defensive escorts armed with anti-submarine weapons. Many German and Allied and merchant ships fought and sank off the North Carolina and Virginia coasts.

The wrecks of these sunken ships still lie at the bottom of the ocean. It is the job of maritime archaeologists to find and study these links to our past in order to better understand our history, conserve our heritage, and honor the memory of those who died defending our nation's future.

To better understand these cultural resources, maritime archaeologists document them by physically mapping the shipwrecks. Once the shipwreck is mapped, a site plan is created. During the dives, numerous images are taken to enhance the detail of the site plan and to provide a complete photo documentation of the resource. This thorough documentation gives researchers a complete snapshot of the shipwreck at that moment in time, thus allowing them to study the site, learn about its history and even gather information on how shipwrecks deteriorate over time.

Activity Summary

Maritime archaeology is a field of study that provides many career opportunities based in science, technology, engineering, and mathematics (STEM). The focus of this lesson is the creation of a shipwreck site plan. The students engage in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. The students make connections to maritime history, mathematics, and technology.

NOTE: Extension activities incorporate English language and social studies.

Section F

Historically Significant



Section of the armor belt, USS Monitor
Photo: NOAA, Monitor Collection

Grade Level

6-12

Timeframe

1-2 hours

Materials

- Computer with Internet access or
- Printed resources for students to use in researching the National Register

Activity Summary

In this lesson, students will explore the National Register of Historic Places focusing on the nomination process of vessels. Students learn the complex process of determining if a vessel is historically significant.

Learning Objectives

- To identify various criteria required for a vessel to be classified as historically significant
- To use knowledge learned and construct a fictitious nomination for the National Register.
- To analyze nominations based on criteria learned.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:II; NCSS:HT.1 and 3;
CCS.ELA.LIT.R.14; NCTE:1, 5, 7 and 8;
OL6.7

Ethically Speaking



Military craft, such as the U-352 off Beaufort, N.C., are protected by the Sunken Military Craft Act.
Photo: NOAA, Monitor NMS

Grade Level

6-12

Timeframe

1-2 hours

Materials

Computer with Internet access or printed resources

Activity Summary

Students answer an overarching question: Do divers have the right to take artifacts from shipwrecks? They will explore how and why military craft are protected and engage in a Socratic Seminar.

Learning Objectives

- To understand that shipwrecks offer a window into the past and should not be disturbed.
- To learn about the Sunken Military Craft Act and other protections for cultural resources.
- To debate using a Socratic Seminar.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:II, III, V, VI and IX;
CCSS.ELA.LIT.R.14;
CCSS.ELA.LIT.SL.1-6; NCTE:1, 3, 7 and 8;OL6 and 7

The Art of Artifacts



Government issued pocket comb found in the USS Monitor's turret. Photo: NOAA, Monitor Collection

Grade Level

6-12

Timeframe

2-4 hours

Materials

- Variety of objects to represent artifacts (see *Teacher Preparation and Implementation*)
- Variety of broken objects and a basket for each group (see *Teacher Preparation and Implementation for Activity C*)

Activity Summary

This lesson engages students to explore the recovery of artifacts and recognize the importance of skilled archaeologists in any recovery efforts.

Learning Objectives

- To understand that artifacts should only be removed by trained archaeologists
- To experience the difficulty in identifying unfamiliar artifacts and to make inferences.
- To discover the difficulty in piecing together artifacts

Vocabulary

See Vocabulary Box

National Standards:

NCTE:1; NCSS:HT.1, 2, 3, 4 and 5;
CCSS.ELA.LIT.RH.7; OL6 and 7

Conservation and Conservators



USS Monitor's turret shortly after recovery. Photo: NOAA, Monitor Collection

Grade Level

6-8; easily adapted for 9-12

Timeframe

1-2 hours

Materials

See *Teacher Preparation and Implementation* for each activity's materials

Activity Summary

This lesson engages students to explore the conservation of artifacts through online learning and experiments.

Learning Objectives

- To understand that artifact conservation is complex and can take years to complete
- To observe the destructive properties of rust
- To discover that modern metals differ from historic metals

Vocabulary

Background

When planning to recover artifacts from a marine archaeological site, two of the most important items to consider are: 1) how to preserve the artifact and 2) how much it will cost (and who is funding it). Without conservation, most artifacts would perish and all historical information would be lost. Conservation may seem like a straightforward and simple process, but it is very complicated. Conservation is also time consuming and expensive, often costing more than the original recovery of an artifact.

Conservation does not simply involve a single set of procedures; therefore, only highly trained professional conservators should work to conserve artifacts. Moreover, professional conservators are often the first person to see an actual artifact, and for that reason, they are deeply concerned with the integrity of the artifact and the history it represents.

Conservators take on the same responsibilities as an archaeologist, and they also fill the roles of a mender, caretaker and recorder of the artifacts they conserve. They take great care to handle the artifact with respect and ensure that the artifact is conserved correctly. Additionally, conservators are guided by a set of ethical guidelines adopted by the International Institute for Conservation.

When artifacts are recovered from a salt water environment, they must not be allowed to dry. Artifacts absorb salt from the water and over time, these salts become embedded in an artifact, especially in iron objects. The presence of salt can be fatal for an artifact, because as the artifact dries, salt comes out of solution and crystallizes. Salt crystals act as tiny wedges breaking apart an artifact. Therefore, before an artifact can dry, the salt must be removed. The salt removal process varies in length. Many other factors can also affect the length of time it takes to conserve an artifact, such as its size and source material.

Removing salt from objects can take years or even decades, like with the USS Monitor's turret. The process requires that skilled, professional conservators and other support staff are hired. A facility must be acquired and then, there are numerous other costs, such as utilities, supplies, chemicals and more.

Therefore, funding is a key component in recovering artifacts from a shipwreck

SCUBA, SCUBA, SCUBA—DO!

Activity D



Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Activity Overview

Students learn the history of scuba diving, through important inventors and divers. After choosing a historical figure in

Vocabulary

scientific diving—diving performed as a necessary part

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Name: _____

Date: _____

The People of SCUBA
Class Activity

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Historical Inventors and Divers

Pioneers of Diving

- John Smeaton (1724-1792): air pump
- Sieur Fremont (1700s): recycled air
- William James (1800s): iron belt
- Benoît Rouquayrol (1826-1875): and Auguste Denayrouze (1837-1883): rigid diving suit
- Henry Fleuss (1851-1932): closed circuit breather
- Victor Berge (1891-1974): helmet diving
- Émile Gagnan (1900-1979): inventor of demand regulator
- Philippe Tailliez (1905-2002): skin & scuba diving
- Philippe Diolé (1908-1977): undersea exploration
- Teseo Tesei (1909-1941): inventor of human torpedo
- Jacques-Yves Cousteau (1910-1997): co-inventor AquaLung
- Frédéric Dumas (1913-1991): spearfishing, wreck diving
- Ame Zetterström (1917-1945): mixed gas diving
- Hans Hass (1919-2013): underwater photography
- Eduard Admetlla i Lázaro (1924-): inventor of scuba diving device & deep diving [clarification needed]
- James F. Cahill (1926-2008): scuba diving
- Nick Icom (1929-2013): scuba & rebreathers
- Robert Sténut (1933-): first Aquanaut
- Gary Gentile (1946-): wreck diving
- E. Lee Spence (1947-): underwater archaeology
- Sheck Exley (1949-1994): cave diving
- Bret Gilliam (1951-): technical diving
- Bill Nagle (1952-1993): wreck diving
- Wesley C. Skiles (1958-2010): cave diving
- Jarrod Jablonski (1969-): technical diving
- Dick Rutkowski: diving medicine, diver training
- Tom Mount: technical diving

Record Holders for Depth or Cave Penetration
(Scuba and surface supplied)

- Simon Mitchell
- Claudia Serpien
- Jim Bowden (diver)
- John Bennett (diver) (1959-2004)
- Mark Elyatt
- Nuno Gomes (diver) (1951-)
- Pascal Bernabé



L-R: Nick Icom, Henry Fleuss, and Jacques Cousteau

Notable for Other Reasons

- Craig B. Cooper (born 1949?): Aquanaut
- George F. Bass (1932): Early underwater archaeologist
- James Talacek: Aquanaut
- Nate Bender: Aquanaut
- Berry L. Cannon (1935-1969): Aquanaut
- Dominic Landucci: Aquanaut
- Dewey Smith (1972-2009): Aquanaut
- Karen Kohanowich: Aquanaut
- Lionel Crabb
- Carl Brashear (1931-2006): First African American US Navy Diver
- Michael C. Barnette
- Willard Franklin Searle (1924-2009)
- Agnes Milowka (1981-2011)
- Bob Halstead (born 1944)
- David Shaw (1954-2005)
- Deon Dreyer (1974-1994)
- Joachim Wendler (died 1975)
- Keith Jessop (1933-2010)
- Leigh Bishop (born 1968)
- Stephanie Schwabe (born 1957)
- Steve Lewis (diver)
- Ted Eldred (1920-2005)
- Trevor Jackson (diver) (born 1965)
- Billy Deans (diver)
- Fabien Cousteau (born 1967)
- Graham Jessop (born 1957)
- John Chatterton (born 1951)
- Jean-Michel Cousteau (born 1938)
- Richie Kohler
- Oscar Guzen (born 1910)
- Philippe Cousteau (1940-1979)
- Mark Hulsbeck (born 1956): Aquanaut

Facebook—Sample Template

Social Media Profile

Date of Birth: _____

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks



Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Sample Fact Sheet

George F. Bass—Scuba Diver and Founder of Marine Archaeology

Images of George F. Bass



Lesson Plans, Activities and More!



Costs of war from the Civil War

Grade

Time

Materials

Key Words

Activity Summary

Learning Objectives

National Standards

History 5-12: 1A, 1B, 1C, 1D, 1E, 1F, 1G, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 5A, 5B, 5C, 5D, 5E, 5F, 5G, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 7A, 7B, 7C, 7D, 7E, 7F, 7G, 8A, 8B, 8C, 8D, 8E, 8F, 8G, 9A, 9B, 9C, 9D, 9E, 9F, 9G, 10A, 10B, 10C, 10D, 10E, 10F, 10G, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 12A, 12B, 12C, 12D, 12E, 12F, 12G

Lights, Camera, Action!



John Enosson, inventor of the movie camera
Courtesy The Mariners Museum

Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials

- Computer
- Journal
- Rubric

Key Words

Ironclad, Turret

Activity Summary

Students research the Hampton Roads battle of the Civil War and create a video summary.

Learning Objectives

To understand the Hampton Roads battle of the Civil War.

National Standards

History 5-12: 1A, 1B, 1C, 1D, 1E, 1F, 1G, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 5A, 5B, 5C, 5D, 5E, 5F, 5G, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 7A, 7B, 7C, 7D, 7E, 7F, 7G, 8A, 8B, 8C, 8D, 8E, 8F, 8G, 9A, 9B, 9C, 9D, 9E, 9F, 9G, 10A, 10B, 10C, 10D, 10E, 10F, 10G, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 12A, 12B, 12C, 12D, 12E, 12F, 12G

Drumming



Grade Level

- 4-8

Timeframe

- 1-2 hours

Materials

- Computer
- Paper and pencil

Key Words

- Drummer
- Civil War

Activity Summary

This lesson focuses on the role of drummers during the Civil War.

Learning Objectives

To understand the role of drummers during the Civil War.

National Standards

History K-4: 1A, 1B, 1C, 1D, 1E, 1F, 1G, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 5A, 5B, 5C, 5D, 5E, 5F, 5G, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 7A, 7B, 7C, 7D, 7E, 7F, 7G, 8A, 8B, 8C, 8D, 8E, 8F, 8G, 9A, 9B, 9C, 9D, 9E, 9F, 9G, 10A, 10B, 10C, 10D, 10E, 10F, 10G, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 12A, 12B, 12C, 12D, 12E, 12F, 12G

A Look at the Past



Drawing of the USS Monitor
Courtesy U.S. Navy

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials

- Computer
- Journal
- Rubric

Key Words

Artifact, Ironclad

Activity Summary

This lesson focuses on the USS Monitor and its role in the Civil War.

Learning Objectives

To understand the role of the USS Monitor during the Civil War.

National Standards

History 5-12: 1A, 1B, 1C, 1D, 1E, 1F, 1G, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 5A, 5B, 5C, 5D, 5E, 5F, 5G, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 7A, 7B, 7C, 7D, 7E, 7F, 7G, 8A, 8B, 8C, 8D, 8E, 8F, 8G, 9A, 9B, 9C, 9D, 9E, 9F, 9G, 10A, 10B, 10C, 10D, 10E, 10F, 10G, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 12A, 12B, 12C, 12D, 12E, 12F, 12G

Putting the Past to Rest



Photomosaic of the Monitor
Courtesy NOAA

Grade Level

- 4-6

Timeframe

- 1 hour or less

Materials

Photomosaic copy

Key Words

Maritime Archaeology

Photomosaic, Site

Activity Summary

This lesson focuses on the role of maritime archaeologists in recovering shipwrecks.

Learning Objectives

To recognize the role of maritime archaeologists in recovering shipwrecks.

National Standards

Science K-4: Science and Technology, and Human Endeavor

Growing Up



Grade Level

- 4-8

Timeframe

- 1-2 hours

Materials

Computer with Internet access

Key Words

Genealogy, Ancestry

Activity Summary

This lesson focuses on the role of genealogy in understanding the past.

Learning Objectives

To recognize the role of genealogy in understanding the past.

National Standards

History K-4: 1A, 1B, 1C, 1D, 1E, 1F, 1G, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 4A, 4B, 4C, 4D, 4E, 4F, 4G, 5A, 5B, 5C, 5D, 5E, 5F, 5G, 6A, 6B, 6C, 6D, 6E, 6F, 6G, 7A, 7B, 7C, 7D, 7E, 7F, 7G, 8A, 8B, 8C, 8D, 8E, 8F, 8G, 9A, 9B, 9C, 9D, 9E, 9F, 9G, 10A, 10B, 10C, 10D, 10E, 10F, 10G, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 12A, 12B, 12C, 12D, 12E, 12F, 12G

When Johnny Comes Marching Home



Grade Level

- 4-8

Timeframe

- 1-2 hours

Materials

Computer with Internet access, paper, pencils

Key Words

Shanty, Sea Shanty

Activity Summary

This lesson focuses on the songs of the Civil War and what role music played.

Learning Objectives

To learn the role that music played during the Civil War.

National Standards



Background Information

Music could be heard throughout the Civil War amongst soldiers, sailors, slaves, women, men, and children. Many of the songs were taken from print, memory, or passed down orally and were sung because they were familiar songs that brought comfort or inspiration. New lyrics were often created to embellish traditional songs and the words were pertinent to circumstance or motivation.

Some songs originated as African-American spiritual songs. Slaves and workers in the fields often sang spiritual songs to bring courage, strength, and unity to the unkind conditions in which they lived and worked. Spiritual songs were usually composed in the moment, reflecting suffering or understanding.

Shanties were work songs set to a tempo that synchronized to repetitive tasks. Sea shanties, such as *Blow the Man Down*, also brought men together who worked on the ships at sea. The songs had a purpose and the lyrics harmonized with the sailors' labors. There were also patriotic battle songs that inspired and united the troops. Sailors and soldiers had songs about the flag and love of country, their sweethearts, religion, and even drinking songs. Music offered a time for the soldier and sailor to relax and reflect.

Women, children and the men who did not go to war, also sang songs that revealed their suffering and hope for an end to the war. Civil War songs span from spiritual and protest to historical, shanty, and traditional. Action songs roused people to raise their voices. Traditional songs and ballads spoke of heritage and remembrance.

Today, songs usually are sung for entertainment. However, some still serve the purpose to pass down oral traditions, show love of country, pay tribute to the struggles of ancestors, or to protest in order to rally people to action.



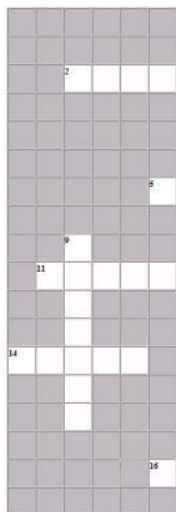
The Civil War in Review



Test Your USS *Monitor* Knowledge



Name a state that borders Virginia to the west	Name one of the Union ships that participated in the Battle of Hampton Roads other than the <i>Monitor</i>
Name one partner from a <i>Monitor</i> expedition	Name of the ocean where the <i>Monitor</i> sank
Name of the US President during the Battle of Hampton Roads	Why did the <i>Merrimack</i> sink?
Name one member of the <i>Monitor</i> crew	What is an ironclad vessel?
Name one of the ocean currents located near the shipwreck site of the <i>Monitor</i>	Where did the <i>Monitor</i> sink?



Across

4. First state to secede from the Union
6. A woman who led many slaves to freedom
8. The _____ Railroad helped slaves escape to freedom
10. First Confederate ironclad
12. The withdrawal of a state from the Union
13. A proclamation giving freedom to Southern slaves
14. Battle between USS *Monitor* and CSS *Virginia*

Down

1. A kitchen artifact from the USS *Monitor*
3. Name of the CSS *Virginia* before Confederates captured her
6. Large government organization protects the USS *Monitor*
7. The study of history using the things people leave behind
8. The huge mechanical claw that the turret
9. Union President during the Civil War
12. How many cannons did the USS *Monitor* have?
15. One way to record a shipwreck (Kodak could help with this)

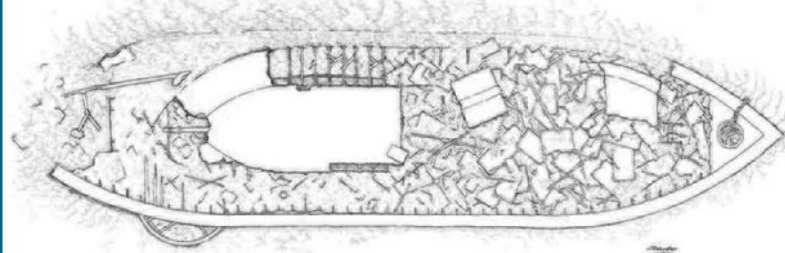
Cross

Tour the Wreck of the USS *Monitor*



Monitor National Marine Sanctuary

Move mouse cursor slowly around plan view for details and images.



Learning Modules

Mock Shipwreck Activity

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration



Education

Mock Shipwreck: Mapping the Past



Grade Level

- Grades 9 – 12

Timeframe

- 45 – 90 minutes

Materials

- Mock shipwreck tarp/outline
- Tape (scotch/duct)
- 30ft measuring tape
- Shorter measuring tape (enough for each pair/group of students)
- Clipboards (enough for each pair/group of students)
- Log Sheets (provided)
- Dive Slate (provided)

Key Words

- Maritime Archaeology
- Site Plan
- Baseline
- Scale Factor



Activity Summary

Maritime archaeology is a field of study that provides many career opportunities based in science, technology, engineering, and mathematics (STEM). The focus of this lesson is the creation of a shipwreck site plan. The students engage in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. The students make connections to maritime history, mathematics, and technology.

NOTE: Extension activities incorporate English language and social studies.

Learning Objectives

Students will be able to:

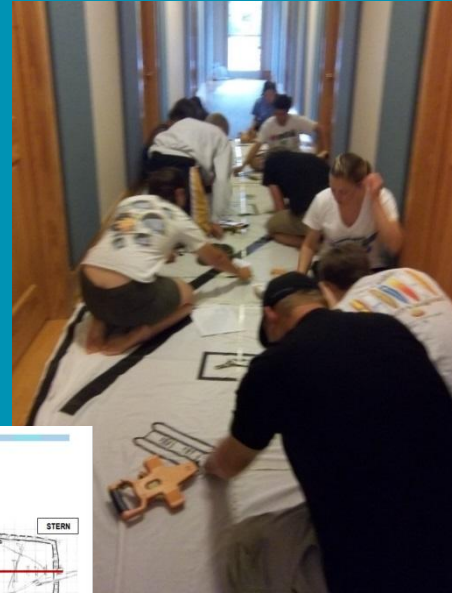
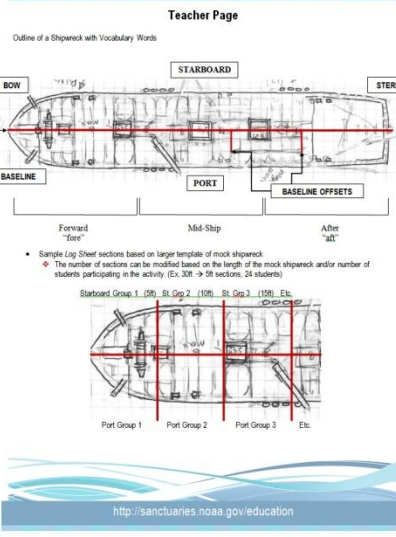
- Define maritime archaeology and describe its importance to our national maritime heritage.
- Employ measuring and scaling techniques to sketch drawings of a mock shipwreck to better understand how divers document an actual shipwreck.
- Determine the scale factor of their drawing in relation to the mock shipwreck.
- Make inferences about the mock ship

Background Information

During World War II, many battles were fought at sea. The U.S. Navy consisted of several skirmishes and decisive battles. The U.S. Navy and Allied merchant ships fought in the Atlantic Ocean.

The German U-boats were under orders to sink Allied merchant ships. The U.S. Navy acted as defensive escorts armed with anti-aircraft guns and depth charges.

The wrecks of these sunken ships still lie on the ocean floor. Maritime archaeologists find and recover artifacts from these wrecks to understand our history, conserve our heritage, and honor those who died defending our nation's freedom.



<http://sanctuaries.noaa.gov/education>

<http://sanctuaries.noaa.gov/education>



Shipwrecks as Reefs: Biological Surveys



Grade Level

- Grade 6 – 8

Timeframe

- 45 – 90 minutes

Materials

- 20ft Measured rope or measuring tape (x2)
- Cut-outs of fish species and benthic species
- 2ft x 2ft square frames (e.g. rulers taped together)
- Clipboards
- Student sheets

Key Words

- Artificial Reef
- Biological Survey
- Transect Line
- Quadrat
- Biodiversity

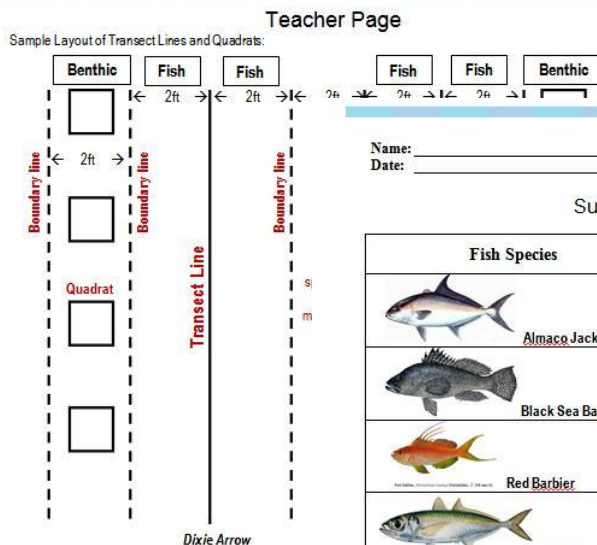


Activity Summary

The focus of this lesson is to have students practice methods of surveying. Students will make observations and then make inferences about the environment.

Learning Objective

- Students will be able to:
 - Define artificial reef
 - Demonstrate data
 - Illustrate graphical
 - Compare surveys to effects of the factors



Distribution

Wreck	Almaco Jack	Black Sea Bass	Red Barbier	Sand Sh
EM Clark	4	0	35	
Dixie Arrow	0	4	0	

Wreck	Algae	Cnidaria	Chordata
EM Clark	10	7	0
Dixie Arrow	40	5	10

Name: _____
Date: _____

Shipwreck: _____

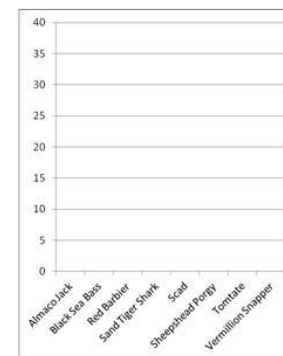
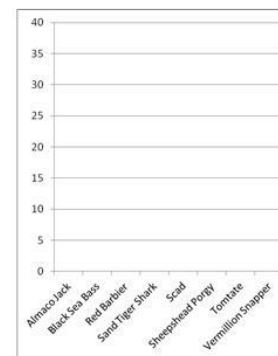
Survey Log – Transect Line

Fish Species
Almaco Jack
Black Sea Bass
Red Barbier
Scad
Sheepshead Porgy
Tomtate
Vermilion Snapper
Sand Tiger Shark
Total Number of Fish

Analyzing Your Data Part 1

Now that you made observations and collected data, what do you do? In order to draw conclusions or make inferences about the environment, scientists must be able to analyze data they have collected. Follow the steps below using the species count data you have collected.

- Create bargraphs for the Transect Line – Fish Counts
 - Title each according to the shipwreck surveyed
 - Label the x-axis and the y-axis
 - Draw bars based on your fish counts



- Compare the shipwrecks:

Shipwreck	Total Number of Fish	Total Number of Species	Most Common Species	Least Common Species	Species present at both wrecks
EM Clark					
Dixie Arrow					

<http://sanctuaries.noaa.gov>

<http://sanctuaries.noaa.gov>

<http://sanctuaries.noaa.gov>

Shipwrecks as Reefs



Education

In or Out? Debating Entrance into the Great War



Education

The Mystery of the *Mirlo*: Interpreting Primary Sources



Education

Propaganda: Posters with a Purpose



Photo: Library of Congress

Grade Level

6-12

Timeframe

90 Minutes

Materials

- Colored pencils, markers and poster board.
- Large print outs or an A/V projector to display posters for entire class to view and analyze.
- A computer or a computer lab is necessary to access images and resources online.
- Poster-making materials may



Photo: The Royal Naval Division

Activity Summary

This lesson will require students to examine and evaluate propaganda posters used during World War I. At the conclusion of the activity, students will create their own poster which will require the students to demonstrate an understanding of the reasons the United States entered the war.

Learning Objectives

Students will be able to:

- Analyze propaganda posters for bias and symbolism.
- Explain and illustrate the reasons for the United States joining the Allied Powers in the First World War.
- Create an original propaganda poster.
- Evaluate other students' posters and explain which posters are the most persuasive.



Left: Liberty Bond poster
Photo: Walter H. Everett/The Sackett & Wilhelms Corporation, N.Y.
Right: Urging women to knit socks for soldiers.
Photo: American National Red Cross

World War I



Education

Life during the War: My Scrapbook



Education

WWI Profiles: Historical Voices in Modern Technology



Education

Zimmerman Telegram: The Last Straw

Grade Level

- 7-12

Timeframe

- 90 Minutes

Materials

- Handout modeling code breaking (provided)
- Handout with code to break (provided)
- plain paper for students to make their own code,
- access to Internet to use Cryptokids website to make their own code (<http://www.nsa.gov/kids/home.shtml>) or Wordles to make a cryptogram at (<http://www.wordles.com/getmycrypto.aspx>)

Key Words

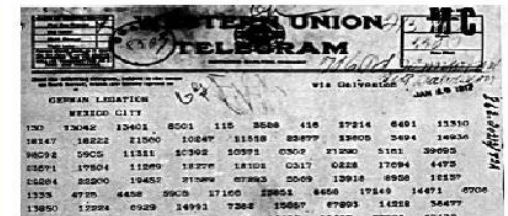


Photo: Bentley Northside Research Group

Activity Summary

This lesson focuses on the importance of the Zimmerman Telegram and other causes of World War I. Students are given a portion of the Zimmerman Telegram and must break the code and analyze the message. They are asked to think critically to determine how Americans and key decision makers, who wanted to be neutral in the European war, would feel about the telegram. Finally, they will make their own short code on how to avoid another world war.

Learning Objectives

Students will be able to:

- Examine the causes of U.S. involvement in World War I
- Demonstrate the value in military intelligence practices, such as code breaking

Background Information

The assassination of Archduke Franz Ferdinand in Austria-Hungary set off a chain reaction of defense alliances that in 1914 led Europe into war. Austria-

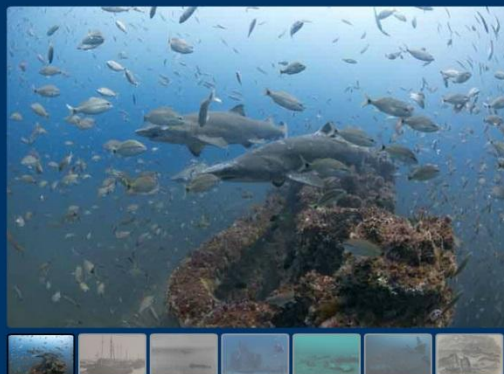


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Please share this site by posting the icon below on your own website. [Click here](#) for icon installation directions.



Images



Sand tiger sharks and schools of fish are just a few of the marine organisms that can be found living on and around the shipwrecks off the coast of North Carolina. (Credit: NOAA)

Welcome to the Outer Banks Maritime Heritage Trail. Click the arrow buttons on the map to play the videos and click [+] below for descriptions of each video.

Coastal North Carolina is an extraordinary place with strong ties to the marine environment. Surrounded by water, the Outer Banks of North Carolina are a chain of narrow barrier islands separating the Currituck, Albemarle, and Pamlico Sounds from the Atlantic Ocean. This dynamic environment has shaped the islands and its people for centuries.

Along Highway 12 are a series of iconic places and features that make the Outer Banks unique. From the lighthouses to the wildlife to the shipwrecks offshore, the Outer Banks culture reflects the surrounding marine environment. We invite you to take a trip down this stretch of road and experience the maritime heritage of the Outer Banks of North Carolina through videos, pictures, and stories.

Videos

- 1 Video: "Introduction"
Start at Whalebone Junction
- [+] 2 Video: "The Story of the U-85"
- [+] 3 Video: "The Ecology of the Outer Banks"
- [+] 4 Video: "WWI and WWII off the Coast of North Carolina"
- [+] 5 Video: "The Chicomacomico Life Saving Station"
- [+] 6 Video: "The Cape Hatteras Lighthouse"
- [+] 7 Video: "The Story of the U-701 and the YP-389"

[Click here](#) for more information about the Outer Banks.

Oral Histories

The residents of the Outer Banks have amazing stories to tell. Their lives are constantly influenced by the marine environment in which they live and their stories are as unique and dynamic as their surroundings. During WWII, many residents were witness to the Battle of the Atlantic which occurred along the East Coast of the United States. Listen to their stories as they recall their experiences with the war that was being fought right off of their shores.

- Carol Dillon
- Carol Dillon (2)
- Gibb Gray
- Anne Henry
- Anne Henry (2)
- Lorraine Hinnant
- John Watkins

Educational Activities

Students experience the unique maritime culture of the Outer Banks, N.C., when they watch one, or all ten, video clips and listen to the oral histories of those who experienced WWII on the shores of the Outer Banks. Each video is accompanied by supporting activities and a set of focus questions, to be answered while the students view the video.

[Click here](#) to download the educational activity packet.

OBX Maritime Heritage Trail

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration



Education

Outer Banks Maritime Heritage Trail



USS Monitor (2011) is located 16 miles South-South East of Cape Hatteras, N.C. Photo: NOAA

Grade Level

- Grade 4-12

Timeframe

- Each video is approximately 3-5 minutes. They can be viewed as a class or students can view them independently.

Materials

- Internet/Computer
- Worksheet

Key Words

- Cape Hatteras
- Diversity
- Ecosystem
- Gulf Stream
- Ironclad
- Outer Banks
- Sanctuary
- Sonar
- U-boats

Background Information

Coastal North Carolina is an extraordinary place with strong ties to the marine environment. Surrounded by water, the Outer Banks of North Carolina are a chain of narrow barrier islands separating the Currituck, Albemarle, and Pamlico Sounds from the Atlantic Ocean. This dynamic environment has shaped the islands and its people for centuries.

Along Highway 12 are a series of iconic places and features that make the Outer Banks unique. From the lighthouses to the wildlife, to the shipwrecks offshore, the Outer Banks' culture reflects the surrounding marine environment.

Through videos, pictures, and stories, we invite you to take a trip down this stretch of road and experience the rich maritime heritage of the Outer Banks of North Carolina.

Activity Summary

Students experience the unique maritime culture of the Outer Banks, N.C., when they watch one, or all ten, video clips and listen to the oral histories of those who experienced WWII on the shores of the Outer Banks. Each video is accompanied by a set of focus questions, to be answered while the students view the video, and other supporting activities.

Learning Objectives

Students will be able to:

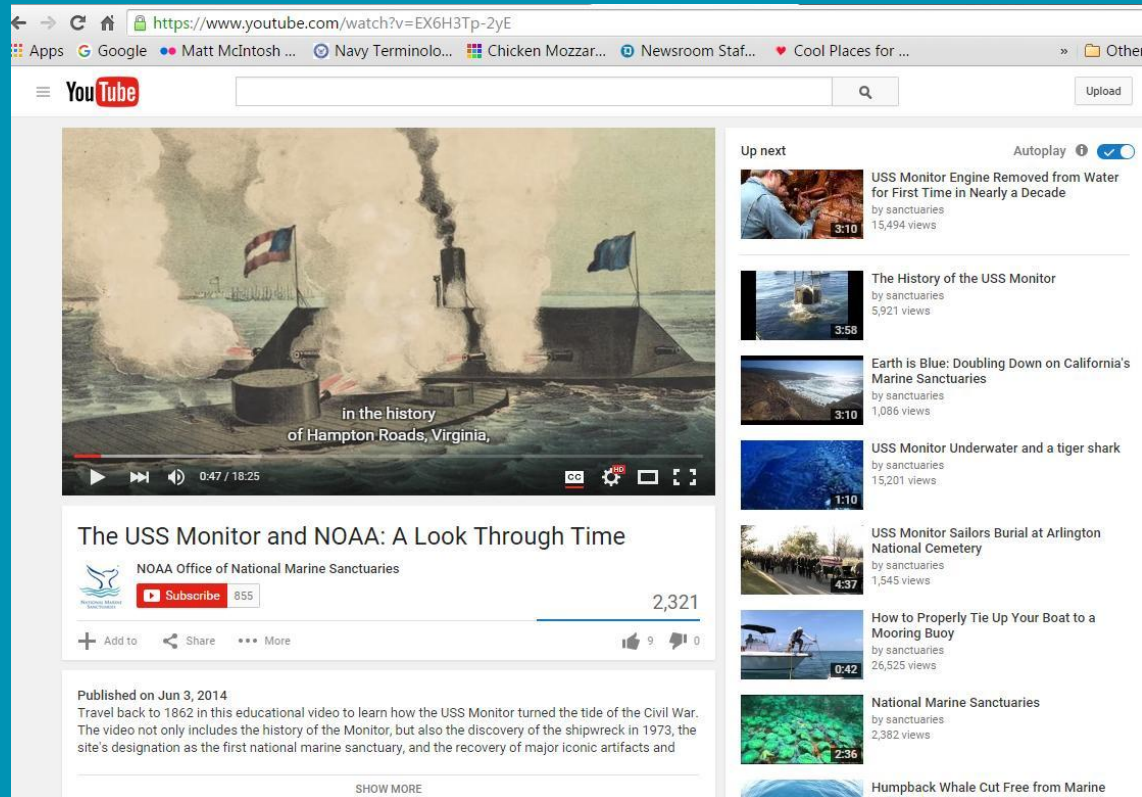
- Recognize unique features of the Outer Banks, N.C.
- Understand the area's significance during World War II
- Discover the final resting place of the USS Monitor
- Appreciate the importance of lighthouses along the coast
- Explain why this area is called *The Graveyard of the Atlantic*
- Learn about the rich ecology of the Outer Banks

Teacher Prep

Download videos and/or oral histories, or bookmark website <http://monitor.noaa.gov/obxtrail/> for students.

<http://sanctuaries.noaa.gov/education>

Video: *The USS Monitor and NOAA: A Look Through Time*



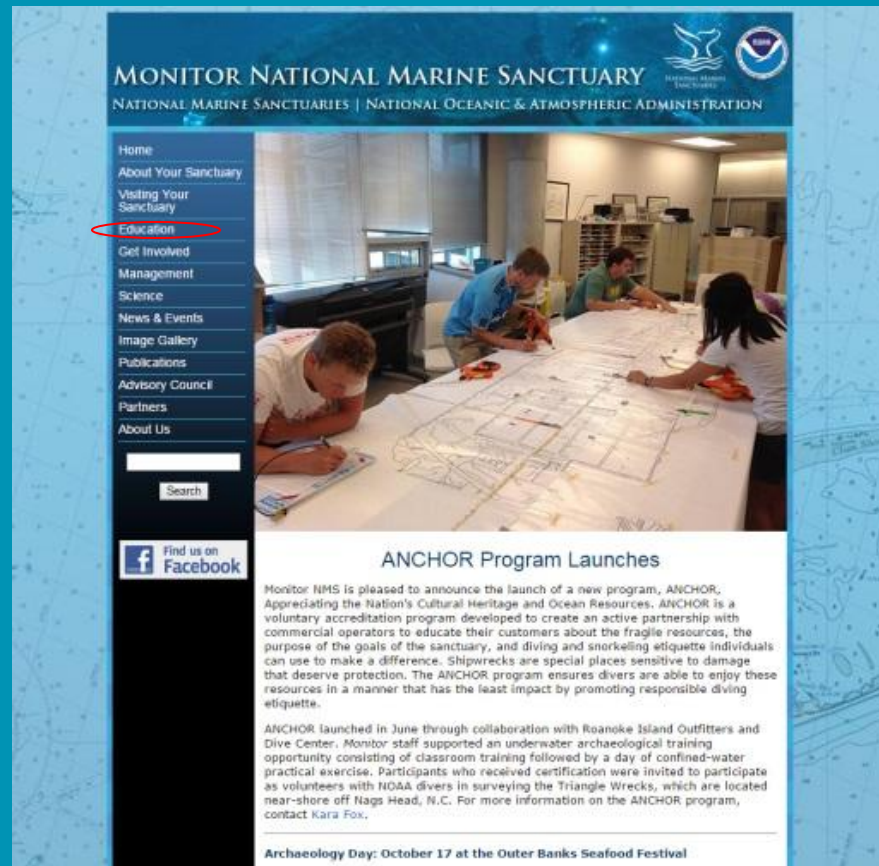
<https://www.youtube.com/watch?v=EX6H3Tp-2yE>

Or visit the "Teacher" Section at <http://monitor.noaa.gov>

To download copies of modules and activities visit:

<http://monitor.noaa.gov>

“Education” Tab



The screenshot shows the Monitor National Marine Sanctuary website. The header includes the title 'MONITOR NATIONAL MARINE SANCTUARY' and the NOAA logo. A sidebar on the left contains a list of navigation links: Home, About Your Sanctuary, Visiting Your Sanctuary, Education (highlighted with a red circle), Get Involved, Management, Science, News & Events, Image Gallery, Publications, Advisory Council, Partners, and About Us. Below the sidebar is a search bar and a Facebook link. The main content area features a photograph of four people working on a large map of a shipwreck site. Below the photo is the heading 'ANCHOR Program Launches' followed by a paragraph describing the program's purpose and goals. At the bottom, it mentions the program's launch in June and provides contact information for Kara Fox.

MONITOR NATIONAL MARINE SANCTUARY
NATIONAL MARINE SANCTUARIES | NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

Home
About Your Sanctuary
Visiting Your Sanctuary
Education
Get Involved
Management
Science
News & Events
Image Gallery
Publications
Advisory Council
Partners
About Us

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Find us on Facebook

ANCHOR Program Launches

Monitor NMS is pleased to announce the launch of a new program, ANCHOR, Appreciating the Nation's Cultural Heritage and Ocean Resources. ANCHOR is a voluntary accreditation program developed to create an active partnership with commercial operators to educate their customers about the fragile resources, the purpose of the goals of the sanctuary, and diving and snorkeling etiquette individuals can use to make a difference. Shipwrecks are special places sensitive to damage that deserve protection. The ANCHOR program ensures divers are able to enjoy these resources in a manner that has the least impact by promoting responsible diving etiquette.

ANCHOR launched in June through collaboration with Roanoke Island Outfitters and Dive Center. Monitor staff supported an underwater archaeological training opportunity consisting of classroom training followed by a day of confined-water practical exercise. Participants who received certification were invited to participate as volunteers with NOAA divers in surveying the Triangle Wrecks, which are located near-shore off Nags Head, N.C. For more information on the ANCHOR program, contact Kara Fox.

Archaeology Day: October 17 at the Outer Banks Seafood Festival

Monitor NMS Education Websites

<http://monitor.noaa.gov/education/teachers.html>



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EDUCATION

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Teachers

The Monitor National Marine Sanctuary offers a variety of free resources for educators. Resources include social studies activities, as well as science, technology, engineering, art, and math (STEAM) activities, lesson plans, and guides. Upon request, the sanctuary staff offers free in-school programs on a variety of topics for the K-12 audience. Free educator workshops for school staff can also be scheduled year round.



Teachers building an ROV during a teacher workshop. (Photo: Monitor Collection)

Below are three sections: Civil War and USS Monitor; Shipwrecks; and Wrecks as Reefs. Each section is filled with STEM activities and lesson plans.

For additional information about specific products and programs, or to request hard copies of products, please contact monitor@noaa.gov. When requesting hard copies of items, please remember to include your physical mailing address.

Civil War and USS Monitor

New Video for Ages 9 (Grade 4) to Adult

The USS Monitor and NOAA: A Look Through Time Video
Travel back to 1862 in this educational video to learn how the USS Monitor turned the tide of the Civil War. Learn about the discovery of the shipwreck in 1973, the site's designation as the first national marine sanctuary, and the recovery of major iconic artifacts and how they are being conserved today. Included are the recent events to identify two Monitor sailors' remains and their burial at Arlington National Cemetery. Funding for this video was provided in part by NOAA & The Preserve America Initiative. Click here to view the [Monitor video on YouTube](#)

Shipwrecks and STEM

Maritime Archaeology: Discovering and Exploring Shipwrecks

This curriculum introduces students to the world of NOAA and its Maritime Heritage Program. Students learn 1) why shipwrecks are important, 2) the tools used to study shipwrecks, 3) about the complex and costly process of recovering and conserving artifacts, and 4) how NOAA works to protect our maritime heritage. Although the curriculum is designed to be taught as a unit, each lesson can stand on its own. The lessons are aligned with national standards.

Shipwreck of the Deep




The project-based curriculum is divided into three parts and based on a storyline where the students are 1) maritime archaeologists that discover and document a shipwreck, 2) engineers that design and build a remotely operated vehicle, 3) researchers that study the wreck as a reef, and 4) conservators that help to determine if artifacts should be recovered. To culminate the unit, students debate in a Socratic seminar and give a final presentation detailing their analysis of the shipwreck and recommendations. The curriculum is designed as a unit, but each activity stands on its own. The unit is aligned to national standards.

Remotely Operated Vehicle (ROV) in a Bucket

Check out this excellent manual to get you started building your own underwater robot. The manual includes a detailed list of ROV parts and pieces and where to find them. (Doug Levin, NOAA Chesapeake Bay Office).






Remotely Operated Vehicles Curriculum Guide

This curriculum introduces middle and high school students to ROVs and careers in marine science and underwater archaeology. Students use problem based learning and hands-on STEM activities to solve real world problems, while learning about the engineering design process. Curriculum can be used in its entirety or activities can be used independently.

-  Teacher One-Pager
-  Student One-Pager
-  ROV Curriculum Guide

Mock Shipwreck: Mapping the Past

This high school activity engages students in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. They make connections to maritime history, mathematics, and technology.

-  Lesson Guide Mock Shipwreck
-  Log Sheets Port 10 Units
-  Log Sheets Starboard 10 Units
-  Log Sheets Port 12 Inches
-  Log Sheets Starboard 12 Inches

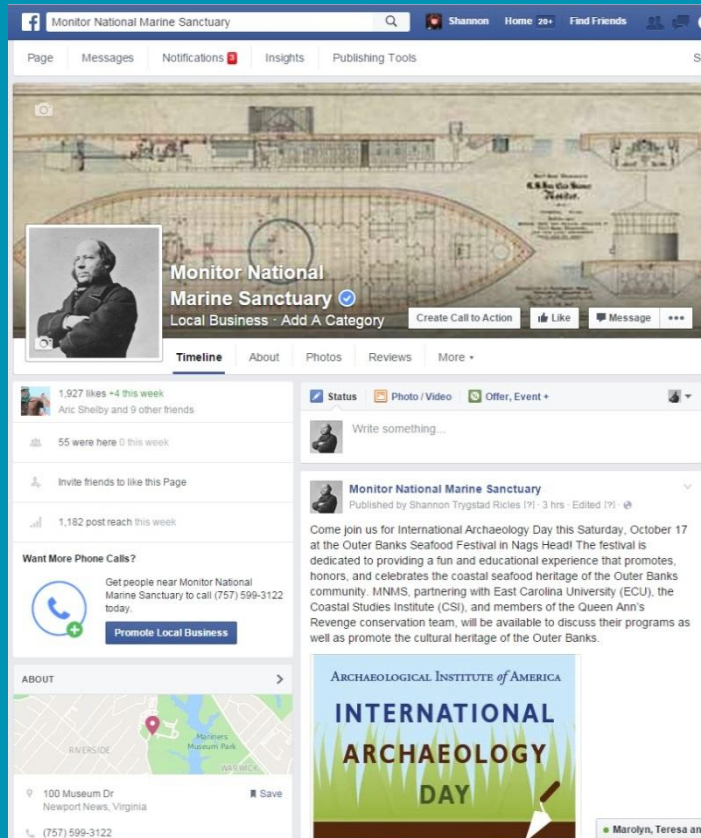
Wrecks as Reefs

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- #MonitorMondays
- #TBT
- #WackyWednesdays
- *Monitor* Trivia
- This Day in History
- Current Expeditions
- And More!

Thank You!

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